The Dock and Harbour Authority

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Editorial Comments

Ports and Politics.

This month's issue of the Journal is prepared for Press amid the bustle and turmoil of a General Election. The atmosphere is charged with electricity of high potential and the air reverberates with party cries and acrimonious vociferations. Such an environment is obviously detrimental to a calm and considered judgment by the electorate on the questions at issue, which are momentous and fraught with vital consequences to the nation. It is a sad commentary on human intelligence that it is so often swayed by party passion and that strident slogans are more potent than reasoned argument.

It may be thought that the field of this Journal lies so remote from electioneering propaganda that it has no occasion to concern itself with the contest now raging. This, however, is only partially true, for there are implications in the political declarations of at least one of the Parties which may profoundly affect the future welfare of ports in this country, and it is desirable to give them very careful thought. The point is in regard to what is called Nationalisation of the country's principal activities.

In this country, politics have not hitherto obtruded themselves into port administration, but it is to be pointed out that this restraint is not inherent in any fundamental or constitutional principle. On the other side of the Atlantic, port government is very largely political. During visits to the United States, we could not fail to be struck by the extent to which port executives depend for their existence on the Party in power, in many cases going out of office automatically with a change in State or Federal administration. That this impression is well founded and not the hasty judgment of a casual visitor is borne out by the following expression of opinion by a high American port official. Writing shortly before his death in 1923, Mr. Benjamin F. Cresson, at the time Chief Engineer of the Port of New York Authority, said: " It seems impossible to divorce port control entirely from politics and more than one port has suffered by political domination and by the ability, abruptly and without redress, to change the entire policy of its development and operation."

We concur in Mr. Cresson's view that this is a regrettable state of affairs, and we trust that the electorate of Great Britain will never be so ill-advised as to place their ports and commerce at the mercy of the winds and waves of Party faction.

Written too late to have any effective bearing on the present election, the admonition may be considered superfluous, but we feel it is necessary, because the indefinite continuance in peacetime of controls exercised by the Ministry of War Transport during the war is regarded in many quarters with equanimity, and, as will be seen in the observations by the Director-General, reported in this issue, viewed with complacency in official circles.

The Port of Aberdeen.

Aberdeen, " the Granite City," so called from the prevalence in its buildings of the light grey granite quarried in the vicinity, is distinguished in a number of respects. Of ancient foundation, it has had associations with King Robert the Bruce and William the Lion. In more recent times, it was the boyhood home of that wild and wayward genius, Lord Byron. The distinguished engineers, Rennie, Smeaton and Telford, all took a hand in the design and construction of the harbour. Its University enjoys a world-wide reputation and has produced many notable scholars. In commercial and practical affairs, besides other activities, it is renowned as a great centre of the fishery industry and its fleets of trawlers range over the seas from the Dogger Bank to Iceland and from the Hebrides to the White Sea, making it a fishing port of great importance—first in Scotland and third in rank in Great Britain.

The article on the port, which is published in this issue, is from the pen of Mr. John Anderson, the Harbour Engineer, and embodies extracts from a report which he prepared and submitted in June, 1943, to the Post War Improvement Committee. It comprises a brief review of the present position of the Harbour undertaking and, in a subsequent issue of this Journal, will set out a scheme of port improvements in four stages, which he recommended should be adopted and which has since been approved by the Harbour Commissioners to an extent which involves the expenditure of £500,000 during the first five years after the cessation of hostilities.

The development scheme is based partly upon certain requirements of trading interests, as advocated by various deputations which have waited upon the Commissioners, and partly upon a preliminary assessment by Mr. Anderson of the ultimate possibilities of the port. The former are to be met substantially by a general improvement of existing facilities without expansion,

Editorial Comments—continued

while the latter involves a long term programme of development to increase the accommodation for merchant shipping, should that be considered desirable.

The plan which accompanies the report illustrates four stages in which it is suggested the works should be carried out, as follows: Stage No. 1, improvements to be executed as soon as possible; Stage No. 2, suggested developments designed to provide maximum dock accommodation at minimum cost, including a new entrance dock; Stage No. 3, a new graving dock and developments not considered seriously necessary within the next 15 years; and Stage No. 4, other possible developments in the more distant future.

Our readers are thus provided, through the courtesy of the Harbour Commissioners and of Mr. Anderson, with an opportunity of studying a most interesting programme of port development on the Scottish coast.

Port of Bristol War-time Record.

When a fully detailed and systematic account comes to be written of British activities in connection with the prosecution of the war, there will be a good deal to be said about port and harbour operations. Without in any way minimising or depreciating the valuable services rendered by road and rail transport and by inland waterways, it cannot but be felt, and will be readily admitted, that the key position was held by the ports of this country and of the continent of Europe, for without their aid the country's overseas campaigns would have been rendered almost impossible. The standard of efficiency attained by British ports in the rapid loading and unloading of vessels engaged in the transport of men and munitions has been truly remarkable and will long remain a record for future generations.

The foregoing remarks are prompted by a perusal of the Report on the War-time Activities of the Port of Bristol, which has been prepared by Mr. R. H. Jones, the General Manager of the Port of Bristol Authority and presented to the City Council. Lack of space does not permit of its publication in full, but considerable extracts of its more important features are given on a later page of this issue. It is not only a highly interesting document, but it also bears valuable testimony to the capacity of British port officials to adapt themselves, with their staffs, to the expeditious and efficient solution of abnormal problems and the tackling of unusual types of cargo. Peace-time commodities were displaced by military stores and equipment, many of them of weight and bulk which must have taxed the port's lifting appliances. Not only so, but the work of handling these essential, and frequently dangerous, materials had often to be done amid the confusion of air raids and the bursting of bombs, to say nothing of the resultant fires and conflagrations which ravaged all quarters of the city and port.

It is a grand and highly creditable record of which Bristol may well be proud, and there is no doubt that a number of other British ports can produce records of equal distinction.

Emergency Port Works.

But it is not only in regard to old and well established ports that such commendatory reference can be made. No less remarkable has been the indefatigable ingenuity and skill displayed in contriving and arranging emergency ports and beach landings in new and often unpropitious locations. With the high renown of "Mulberry" and the mushroom development of the beaches at Avromanches everybody in this country is familiar, for it was certainly an outstanding example of administrative enterprise and engineering ability. But there are numerous other instances, albeit not so spectacular, nor on so large a scale as the Normandy landings, of installations and adaptations which have played a wonderful and, perhaps, no less influential part in the war effort. Some of them have already been the subject of notice in these columns and to them may fittingly be added the following particulars of two emergency home ports hastily built and equipped to provide, in Scottish waters, berths for a dozen deep draughted vessels.

The necessity for obtaining sufficient draught of water without recourse to dredging operations led to the selection of two sites in Scottish coastal lochs: one in Gareloch, off the Clyde Estuary, and the other at Cairnryan in Loch Ryan, Wigtownshire. Six berths, each 500 feet long, were provided at the former and five of the same length at the latter site, all having a depth of 33 feet at low water. They were suitably equipped with quay cranes (some of which were transferred from Southampton) and ample railway sidings and connections. The responsibility for the design and execution of these projects rested with Sir Bruce G. White, Director of Ports and Inland Water Transport, who was ably seconded by a staff of expert assistants. The work was commenced at the end of 1940 and the first ship was berthed in July, 1942.

To the vigorous enterprise manifested in the conception and execution of these and many similar works, the country owes in no small measure the brilliant success which has attended the military operations dependent on them.

Harbour Entrance Impediments.

The announcement in this issue of the recent publication of two reports on the causes of inadequate depth in the fairways of harbour entrances on the Western Coast of South Island, New Zealand, is a striking reminder of the perennial trouble besetting the mouth of rivers discharging into seas where coastal drift is a pronounced phenomenon. Both Greymouth and Westport are experiencing a deficiency in depth for shipping at their entrances, which in a large measure is due, to the formation of bars of material drifting across the navigable channel.

The reports presented by the technical experts, called in to advise the two harbour boards concerned, discuss the dual remedies of dredging and mole-extension. Unfortunately, the results obtained by either method can only be considered as temporary in character. Dredging will have to be continuously employed if the results are to be maintained to a serviceable extent, while moles or breakwaters often require prolongation *pari passu* with the accretion of material on their flanks.

It is a troublesome problem, not readily soluble, except in the case where moles can be extended into water of sufficient depth to render siltation ineffective, or, at any rate, innocuous for some considerable time. The experts consulted recommend divergent programmes: mole-extension in one case and intensive dredging in the other. Our readers will be interested in the reasons which are given for the adoption of the respective measures, though in the absence of actual knowledge of the local circumstances, the information published is scarcely sufficient for a final judgment.

Dredging Appliances.

The subject of dredging naturally leads to a consideration of the powerful appliances now available for the prosecution of this kind of work. Since the conclusion of the earlier European War of this century, important developments have taken place in dredger design, as is evidenced by the informative Paper on the subject (to be found in this issue) by Dr. Herbert Chatley whose expert knowledge of dredgers and practical experience in their operation entitles him to speak with great authority. The data respecting a number of modern powerful suction dredgers given in the appendices to the Paper will provide much useful information for harbour engineers. It is interesting to note that the *Leviathan*, built in 1909, still remains practically the largest dredger in existence, though closely rivalled by the *General Goethals* of 1938, while the output of the former under suitable conditions is twice as great as that of the latter, and indeed, though equalled in two other cases, is, with one exception, unsurpassed.

The value of high-powered dredgers for maintaining the fairway entrances to ports can scarcely be over-rated, and many of the first ports in the world owe their accessibility for modern ships to the constant and unremitting exercise of dredging operations. The enormous amount of sand removed from the bar of the Mersey, for instance, for maintenance alone is almost incredible. Up to the commencement of the present war it had well exceeded a hundred million tons, while, if channel deepening be taken into account, it was well over 500 million tons. Such quantities indicate the importance of efficient dredging equipment, and Dr. Chatley's observations on the merits of the various types and their performances are of great value.

Aberdeen Harbour

Interim Report on Possible Improvements and Future Developments*

By JOHN ANDERSON, M.Inst.C.E., Harbour Engineer

IN connection with the investigation of post-war plans for future development of Aberdeen Harbour, the following broad review of existing conditions and preliminary survey of future possibilities is submitted as a stimulus to a discussion on the matter by those chiefly concerned with the future progress of Aberdeen Harbour as the chief centre of the City's commercial growth. It is presented under three main headings:—

(1) Historical development.
(2) Critical review of principal characteristics of the Port.
(3) Suggested developments.

Historical Development

The development of Aberdeen as a shipping centre has been continued over a long period, although, in common with all other ports, its modern growth has been greatly advanced in the past century by the industrial development of the Victorian era. From being an estuary of the Dee flowing towards the sea, with long rambling stretches of tidal waterways broken by sand banks, it has been converted into a compact yet extensive harbourage and port of call for sea-going vessels of considerable size, as well as an important centre of the fishing industry to which the prosperity of a large part of the City's inhabitants have owed so much.

Harbourage.—The principal function of a harbour is, of course, to provide safe access and anchorage to vessels using the waterway. This may be provided by natural topographical features of the surrounding land, or it may be secured by artificial defences against the onrush of the seas towards the land or by a combination of both.

Protective works provided to restrict wave range within the Tidal Harbour at Aberdeen have been developed step by step. Successive engineers have constructed jetties or piers further out to the open sea, with a view to cutting off the heavy seas which break on the shores of Aberdeen when driven by gales from an easterly quarter.

The North Pier has been extended seawards in three lengths since 1769, when the Lower Jetty and the South Jetty provided the only protection of the harbour against the seas. It was extended in 1780 for a length of 1,200 lin. feet by John Smeaton, further extended in 1810 for a length of 900 lin. feet by Thomas Telford and, in 1868, the last extension of 500 lin. feet was built by Wm. Dyce Cay, making its total length 2,600 lin. feet from Lower Jetty.

Prior to the last extension of the North Pier, the south side of the channel was protected by the Old South Breakwater which used to extend 500 lin. feet further into the channel than at present. In 1873, the New South Breakwater was built under the engineer, Wm. Dyce Cay, for a length of 1,050 lin. feet. This was originally intended to be 150 lin. feet longer, but it was apparently later decided to curtail the length. The Old South Breakwater was reduced to its present length in 1876 by the same engineer.

The results of these works to-day are a testimony to the endeavours of those engineers, but much can yet be done to improve the harbourage of vessels.

The depth and width of the Navigation Channel has also been improved within the past twenty-five years to a degree which already ensures the safe passage of vessels of much larger draft than can at the present time make use of the Port owing to limitations of the main entrance to the docks.

Port of Call.—The principal function of a seaport is to provide suitable accommodation in the form of quays with adequate depth of water alongside, facilities for loading and unloading of cargo, sheds for storage or transit of goods, road and rail facilities, etc. The development of a seaport naturally depends on the traffic which it attracts by the facilities which it affords and the areas of industry, agriculture or potential passenger traffic which it serves.

Aerial view of Entrance Channel—Looking Seaward

A brief survey would show that Aberdeen's development as a seaport has been governed by these natural factors of growth, first in its trade with Flanders and the Baltic, later with more distant countries, and later still through the rise of the fishing industry.

Victoria and Upper Docks.—The modern development of the commercial activities of the port dates from the construction, nearly a hundred years ago (1844), of the main or South Entrance with its one pair of gates, and the North Entrance Lock with three pairs of gates. By means of this important and, at that time, bold undertaking, the present Victoria Dock and Upper Dock were freed from the limitations of tidal water basins and converted into what are sometimes called wet docks, permitting large vessels to ride in deep water from the time they arrive alongside the quays until they leave by the simple process of restricting the ebb which occurs in tidal areas twice in every twenty-four hours.

The North Lock was provided to allow of vessels of suitable small draft sailing to and from the docks at any state of the tide,

* Extracts from Report prepared for consideration of Harbour Commissioners in 1943.

Aberdeen Harbour—continued

[Copyright: Pelman, 23, Adelphi, Aberdeen]
Aerial view of River Dee, Eastern part of Albert Basin and Tidal Harbour

by controlling, by means of sluices and gates, the water level of a narrow passage used by the vessels.

The South Entrance, provided with a single pair of gates, was intended for the passage of larger draft vessels entering the docks during high water periods only, by opening the gates some time before high tide until a similar period after high tide. Both these passages originally had 22-ft. of water at H.W.O.S.T., i.e., High Water of Ordinary Spring Tides, over the gate cills. In 1886, the South Entrance was deepened to give 26-ft. of water at H.W.O.S.T.

Owing to increasing drafts of vessels, the North Lock became of less value for their passage, except when used during the upper half of the tides, and therefore redundant, since the South Entrance could already be employed for this purpose. In due course, the North Lock fell into disuse, except for emergency purposes and as a berth for fitting out new vessels, using the Shear Poles, and the South Entrance gradually became the only passage used for vessels proceeding to and from Victoria and Upper Docks. Entrance to the docks by the South Entrance is possible for approximately four hours in every twelve, during which period the Dock Gates are kept open, i.e., two and a half hours before high tide and one and a half hours following high tide.

Tidal Harbour and Albert Basin.—The Tidal Harbour, an area which remains subject to tides outside the dock gates, is used for the manœuvring of vessels leaving the navigation channel and approaching the entrance to the docks. This was very necessary in the days of sailing vessels, prior to the construction of the outer protective works of the North Pier and South Breakwater, and is still required in a lesser degree. Since the diversion of the River Dee in 1878 into its present course, the tidal harbour waters extend from Pocra Quay to Point Law and Torry, providing berths used for general trade, the fishing industry, supply of oil to ships, and also for fitting out vessels under construction.

Pontoon Dock No. 3, installed in 1911, occupies a special berth prepared for it in the Tidal Harbour.

Albert Basin, occupying the site of the old bed of the River Dee, has been developed assiduously and almost entirely for the use of the fishing industry, the most recent work being the construction in 1932 of six protection jetties for security of vessels against the effect of range.

Pontoon Docks Nos. 1 and 2, installed in 1900 and 1908 respectively, occupy specially prepared berths on a section of Albert Quay.

River Dee and River Dee Dock—The berths provided in this portion of the tidal water are used for coal and oil bunkering, general trade, and for icing and laying-up of fishing vessels.

The navigable portion of the River Dee, extending for 1,700 feet westwards from Point Law, is bounded on the north side by Mearns Quay, a timber wharf constructed between 1912 and 1923, and on the south side by Torry Harbour and Quay, River Dee Dock, and a shipbuilding yard.

River Dee Dock, of substantial reinforced concrete construction, was completed in 1914 as an extension of berthage intended for the use of the fishing industry. It is now also being used to provide fitting-out berths for ships under construction or undergoing repair.

Torry Harbour is a small harbour intended for small fishing craft only. The wharves, built of timber in 1898-1905, are not in good condition and the berthage, which is exposed to tidal range, is little used except by very small craft.

Aberdeen Harbour—continued

CRITICAL REVIEW OF PRINCIPAL CHARACTERISTICS OF PORT HARBOURAGE.

Approaches and Harbourage.—The Port of Aberdeen suffers from the defects of its geographical position, standing out as it does on the East Coast; its inner harbourage is within half a mile of the open sea. Under normal weather conditions it is an advantage for vessels to reach open sea within a few minutes after leaving the quay side, but in stormy weather heavy seas are liable to be communicated through the channel to the harbourage, with disturbing effects.

The area is effectively protected by the high ground of Girdleness from the strong gales which whip up the seas from the south, and this natural protection, in alliance with the artificial protection of the South Breakwater, greatly reduces the natural liability of the exposed position to the destructive effects of the elements—but still leaves much to be desired when seas roll in from the east and south-east.

South Breakwater during a storm

The North Pier and South Breakwater have been constructed so as to cut off or divert as much wave movement coming from the sea as possible; to ensure a reasonably safe channel for the approach to the docks and to provide relatively quiet tidal harbourage from Abercromby's Jetty westwards. This it does effectively under some conditions, but occasionally, according to the direction and force of the seas, it is still a matter of concern that considerable range of wave movement (as much as 2-ft. to 2-ft. 6-in.) passes down the channel and is experienced well inside the docks when the gates are open. This is largely due to the bell-mouth lay-out of the outer channel collecting large volumes of angry seas which are driven into the harbourage. The effect of range on ships at quay moorings in the Tidal Harbour and Albert Basin under these conditions is very considerable, and damage to wharves, fenders and ships results from the incessant agitation during prolonged and very stormy weather.

The complete control of such conditions is likely to be difficult, but expense would be justified towards achieving a greater degree of isolation of tidal harbour waters from the turbulent moods of the sea.

Lay-out.—The lay-out of the Docks and Harbour Estate has been largely governed by the gradual development of natural features of the Dee estuary. These natural features have fortunately led to general characteristics which are considered by some authorities to be ideal, i.e., tongues of navigable water separating jetties or piers sufficiently wide for roads, railway and building sites. Thus we have Matthews' Quay and Point Law representing two large jetties (or promontories) projecting into the waterway flanked by the mainland boundaries of Torry and Footdee giving a good resultant ratio of quayage to waterway.

The navigable approach to the docks and quays is natural and direct, and from an operational standpoint the natural and artificial features of the port have produced characteristics of extraordinary compactness and accessibility. Detail features may be improved upon, but the broad lines of the lay-out already provide an excellent foundation for the improvement of port facilities which may be required by the various types of land and sea transport, such as better road approaches, extended rail system, deeper berthage and dock entrance, wider quays and increased dock area.

The following table briefly indicates the particulars of the various sections of waterways and quays.

Tidal Waters	Waterways Acres	Quays Lin. ft.	Depths L.W.O.S.T. ft. in. ft. in.	Depths H.W.O.S.T. ft. in. ft. in.
Tidal Harbour ..	31.25	3,461	15 0 to 16 0	28 0 to 29 0
Albert Basin ...	22.87	5,586	12 0 to 16 0	25 0 to 29 0
River Dee Docks and River Quays ...	16.10	3,906	3 0 to 17 0	16 0 to 30 0
	70.22	12,953		
Non-tidal Waters			L.W. in Docks ft. in. ft. in.	H.W. in Docks ft. in. ft. in.
Victoria and Upper Docks	26.44	6,276	13 6 to 24 6	16 0 to 27 0
Combined Totals	96.66	19,229		

In addition to the above totals, there are also 77.27 acres of waterway in the Navigation Channel and 25.07 acres of unnavigable waterway, making a total waterway of 199 acres. Whilst the overall proportion of shipping waterways to quays (about 4 to 5 acres to 1,000 lin. feet of quay) appears to be satisfactory, the ratio of non-tidal to tidal waterways and quays is small, and this factor in the economy of the port warrants review and, perhaps, comparison with other ports.

Facilities.—New sources of revenue to the Harbour Commissioners should be an important consideration in any scheme of development, but the reduction of transport, cargo handling and maintenance costs is likely to be equally effective in improving the revenue of the harbour by attracting trade. Reduction of these costs can be effected through the facilities provided to shipping generally.

The following brief survey of the present facilities will assist in focusing attention on them:— (a) Dock Entrance; (b) Pontoon Docks; (c) Bridges; (d) Railroads and roads; (e) Cranes; (f) Sheds.

(a) **Dock Entrance.**—An important factor in the use of the port affecting revenue at Aberdeen is undoubtedly short period docking facilities and limitation of draft.

The South Entrance to the docks is formed with sloping walls and rounded floor providing a depth of 26 feet of water at H.W.O.S.T. and width at coping level of 70 feet. This form of profile is not suited to the shape of modern vessels, which are built with almost vertical sides and square, flat keels, extending the full width of the beam amidship. The largest vessel that can be taken comfortably would have a beam of, say, 57 feet and draft of about 20 feet. Narrower vessels can enter with greater draft, but this is an unusual combination unless the vessel is considerably out of normal trim.

So long as the present entrance is considered sufficient for the trade of the port, no improvement is called for except to provide a new system of gates, machinery, etc., to replace the existing system which is now in an unsatisfactory state.*

In view, however, of the depth of water provided in the Navigation Channel, i.e., 32 feet of water at H.W.O.S.T., it is clear that the time is ripe for considering the provision of new entrance facilities.

(b) **Pontoon Docks.**—The three pontoon docks provide good facilities for repair and inspection of vessels, the smaller units, Nos. 1 and 2 Pontoon Docks, being well suited to the requirements of the fishing industry, and No. 3 being capable of docking

* Since submission of the Engineer's Report a steel floating caisson has been provided and is operating in the place of the existing gates now removed, until new welded steel gates already nearing completion can be installed.

Aberdeen Harbour—continued

vessels up to 5,350 tons on the centre keel blocks or several small vessels on the three rows of blocks which are provided.

Nos. 1 and 2 are conveniently situated for the work they carry out and are usefully employed. They could, with advantage, be somewhat larger for the accommodation of the larger type of trawler or small coasting vessel.

No. 3 Pontoon Dock is not very well situated on account of proximity to the Navigation Channel. Occasionally the range of sea motion makes docking of vessels difficult and puts a severe strain on the dock moorings. The dock moorings occupy a considerable area of valuable water space and partially sterilise the use of the quay.

The three docks, being berthed in tidal water, suffer certain limitations of their usefulness at low water, especially when their berths become silted up, and these require to be dredged at regular intervals. The general condition of the three Pontoon Docks is fairly good and they might, given reasonably early overhaul, be maintained in commission for some years to come, but the question of future replacement would be an important item affecting any future programme.

Victoria Dock—Looking West

(c) **Bridges.**—The double-leaf swing bridges which span the North Lock and the South Entrance were built at the same time as the Entrances (i.e., in 1844). The South Entrance bridge, operated by electric motors, has since been strengthened, but the loads on both bridges are now limited to 3-ton vehicles. The North Lock bridge is hand operated. The bridges have single track roadway with two footpaths, so that vehicles cannot pass each other, but must await the right of way. The bridges are, therefore, inadequate for modern traffic both in strength and traffic capacity and should be replaced as early as possible.

Regent Bridge is a single-leaf swing bridge of modern design and construction, capable of carrying two lines of road or rail traffic with pedestrian footpaths on either side. It is operated by hydraulic power generated at the adjacent pump-house, which also supplies power for the dock gates machinery.

This bridge is quite adequate for its purpose of connecting the north and south sides of the docks by road and rail, and can give many years of useful service.

(d) **Quays, Roads and Rails.**—There is a tendency to congestion of traffic at certain points, particularly Upper Quay, Regent Quay and Trinity Quay, but this appears unavoidable without the diversion of through traffic not having business at the harbour, or else the widening of the quays. The system of road and rail communication throughout the harbour area is good. Some of the rail track requires replacement with more modern rails, etc. The road surface generally is good, but where laid in conjunction with the older sections of rail track it is rough and certain areas require to be relaid.

(e) **Cranes.**—The crane facilities are excellent of their kind, but limited in scope so far as the requirements of a modern port go.

The 100-ton shear poles which were originally erected in connection with the installation of boilers and machinery for an exceptionally large vessel, the s.s. *Intaba*, constructed by Messrs. Hall, Russell & Company, are now seldom used to capacity. Although of considerable value to ship builders and repairers, they are of little direct value in advancing the trade of the port.

Three 30 cwts. capacity electric travelling cranes on the roof of the two-storey goods shed, Regent Quay, are convenient and adequate for their purpose of handling goods into the shed or wagons on the quay. Two of them are at present limited to 20 cwts. capacity pending reconstruction.*

There are four locomotive steam cranes ranging from 2½ tons to 9 tons capacity. These are convenient and efficient where they can be used, but their purpose is limited owing to lack of adequate outreach and overhead clearance.†

Pontoon Dock No. 3 is equipped with a 5-ton electric crane which travels along the north wall of the dock.

There are no coal handling facilities other than those under private ownership.

Ships fitting out after launching have no suitable berths available other than that at the North Lock under the Shear Poles or at quays which are normally intended for commercial purposes. No dues are paid for these facilities, which are sometimes inconvenient in the port berthing arrangements.

(f) **Sheds.**—The sheds owned by the Harbour Commissioners and let to shipowners regularly or intermittently are:—

		ft.		
1	Two-storey Goods Shed ...	537 x 50½	Regent Quay	1901 & 1910
2	Single-storey Shed ...	180 x 28	Regent Quay	1902
3	Single-storey Shed ...	150 x 30	Mearns Quay	1927
4	Aberdeen, Newcastle and Hull Coy.'s Single-storey Shed	250 x 50	Waterloo Quay	1916
5	Aberdeen Steam Navigation Coy.'s Single-storey Shed	300 x 28 (av.)	Waterloo Quay	1868 & 1884
6	North of Scotd. & O. & S. Steam Nav. Coy.s Single-storey Shed ...	130 x 35 130 x 130	Matthews' Quay	1889
7	Coast Lines Single-storey Shed	380 x 50	Jamieson's Quay	1885 & 1892

For the most part, the accommodation provided is adequate for the uses to which the sheds are put and they are in good condition, with the exception of the sheds, Nos. 5, 6 and 7‡. Only new traffic or changed trade requirements would appear to justify any great increase of accommodation at the present time, unless in the course of general reconstruction, as in the case of Aberdeen Steam Navigation Company's shed and at Matthews' Quay.

From this brief review of the port's assets and amenities, it may be concluded that, on the whole, its development has been fortunate and well guided in the past. The engineering values of the excellent installations which have characterised the Commissioners' policy in the past are, however, depreciating, and it would appear to be absolutely necessary to ensure now that an organised plan of post-war replacements, reconstruction and development can be set afoot immediately on cessation of hostilities, if the port is not to be placed in a state giving cause for anxiety and perhaps futile strain for some time after the War.

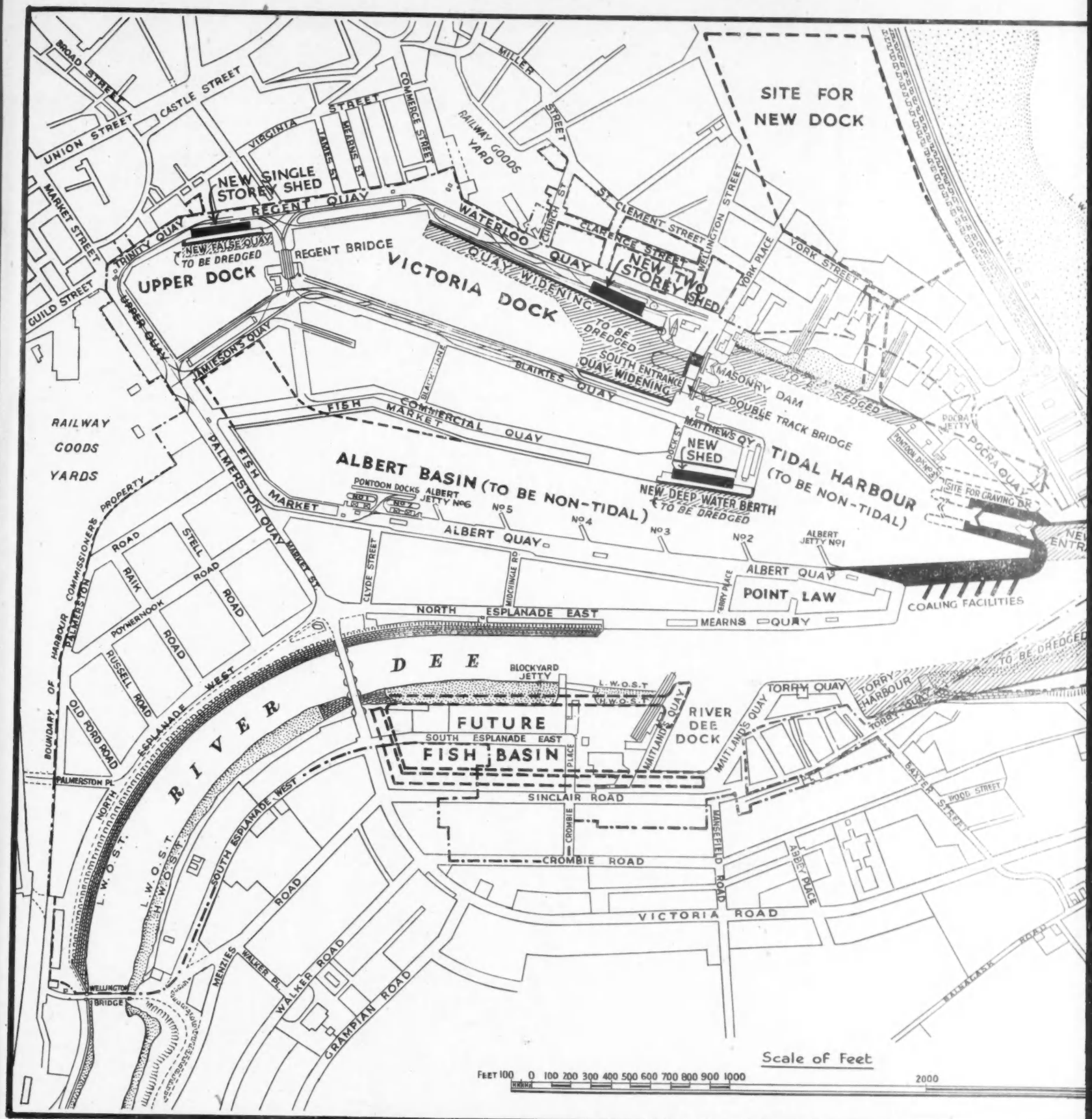
Bearing in mind the difficulties and the indefinable duration of war-time maintenance, it is clear that problems of service are likely to increase before the end of hostilities, centering around the conditions of the Dock Gates and Lock Gates, Dock Gates Bridges, Pontoon Dock No. 3 and, in lesser degree, Pontoon Docks Nos. 1 and 2, Matthews' Quay South, and certain cranes.

(To be continued.)

* Since submission of the Engineers's Report two new 30-cwt. electric roof cranes of improved performance have been completed and are in course of erection to displace these two 20-cwt. cranes.

† Since submission of the Engineer's Report two new locomotive cranes of improved performance have been purchased—one 3-ton Diesel and one 5-ton steam.

‡ Since submission of the Engineer's Report, Jamieson's Quay has been reconstructed 44-ft. in advance of the old line, and the capacity of Shed No. 7 has been increased by an extension of 350-ft. by 36-ft.


SITE FOR NEW DOCK
BROAD STREET
CASTLE STREET
UNION STREET
MARKET STREET
VIRGINIA STREET
JAMES ST
MEARNS ST
COMMERCE STREET
MILLER STREET
RAILWAY GOODS YARD
NEW SINGLE STOREY SHED
REGENT QUAY
TRINITY QUAY
NEW FALSE QUAY TO BE DREDGED
UPPER DOCK
REGENT BRIDGE
WATERLOO QUAY
CHURCH ST
ST CLEMENT STREET
CLARENCE STREET
NEW TWO STOREY SHED
WELLINGTON STREET
YORK PLACE
YORK STREET
VICTORIA DOCK
QUAY WIDENING
TO BE DREDGED
GUILD STREET
UPPER QUAY
JAMIESONS QUAY
BLAIRS LANE
BLAIRS QUAY
SOUTH ENTRANCE QUAY WIDENING
MASONRY DAM
TO BE DREDGED
DOUBLE TRACK BRIDGE
POCRA JETTY
POCRA QUAY
PONTOON DOCK
RAILWAY GOODS YARDS
FISH MARKET
COMMERCIAL QUAY
MATTHEWS QY
DOCK ST
NEW SHED
TIDAL HARBOUR (TO BE NON-TIDAL)
ALBERT BASIN (TO BE NON-TIDAL)
PONTOON DOCKS
ALBERT JETTY No6
No1
No7
No5
No4
No3
No2
ALBERT JETTY No1
NEW DEEP WATER BERTH TO BE DREDGED
SITE FOR GRAVING DR
ALBERT QUAY
ALBERT QUAY
CLYDE STREET
MIDWINGLE RD
FERRY PLACE
POINT LAW
COALING FACILITIES
NORTH ESPLANADE EAST
MEARNS QUAY
PALMERSTON QUAY
MARKET ST
PALMERSTON ROAD
STELL ROAD
RAIK ROAD
POYNERNOOK ROAD
RUSSELL ROAD
OLD FORD ROAD
BOUNDARY OF HARBOUR COMMISSIONERS PROPERTY
ESPLANADE WEST
PALMERSTON PL
NORTH ESPLANADE WEST
SOUTH ESPLANADE WEST
RIVER DEE
BLOCKYARD JETTY
L.W.O.S.T.
H.W.O.S.T.
FUTURE
SOUTH ESPLANADE EAST
FISH BASIN
RIVER DEE DOCK
MAITLANDS QUAY
TORRY QUAY
TORRY HARBOUR
TORRY SLIP
TO BE DREDGED
PLACE
SINCLAIR ROAD
CROMBIE
CROMBIE ROAD
VANSITTART ROAD
ABBEY PLACE
VICTORIA ROAD
BAXTER ST
WOOD STREET
BALNAGASK ROAD
WELLINGTON BRIDGE
MENZIES
WALKER PL
WALKER ROAD
GRAMPIAN ROAD
ROAD
Scale of Feet
FEET 100 0 100 200 300 400 500 600 700 800 900 1000
2000

ABERDEEN HARBOUR

DEVELOPMENT SCHEME PLAN

Engineer to the Aberdeen Harbour Commissioners :- John Anderson, M.INST.C.E., M.I.STRUCT.E.

Stage 1. Quay Widening & Shed at
UPPER DOCK
VICTORIA DOCK
ALBERT BASIN
Breakwater Extension to
SOUTH BREAKWATER

Stage 2. New Quay, N. Side of Tidal Harbour
Dam, Bridge etc. to VICTORIA DOCK
Extension of NORTH PIER
Wave Traps, NORTH PIER &
OLD SOUTH BREAKWATER
New Quay at TORRY QUAY
New 300' / 500' Entrance Lock.
Coaling Facilities.

Stage 3. Future Extensions at POCRA
New Graving Dock

Stage 4. Extension of ALBERT BASIN
Future FISH BASIN
Further Extension of TORRY QUAY
New Dock N. of TIDAL HARBOUR.

SITE FOR NEW DOCK
CLEMENT STREET
WELLINGTON STREET
YORK PLACE
YORK STREET
NEW TWO STOREY SHED
L.W.O.S.T
H.W.O.S.T
MASONRY DAM
DOUBLE TRACK BRIDGE
POCRA JETTY
POCRA QUAY
PONTOON DOCK
SITE FOR GRAVING DR
MATTHEWS QY
NEW SHED
TIDAL HARBOUR
(TO BE NON-TIDAL)
NEW DEEP WATER BERTH
TO BE DREDGED
No 3
No 2
ALBERT JETTY No 1
ALBERT QUAY
POINT LAW
COALING FACILITIES
MEARNS QUAY
PIER EXTENSION
PIER
LINE OF LEADING LIGHTS
NEW LINE OF LEADING LIGHTS
NAVIGATION CHANNEL
TO BE NEW DREDGED ENTRANCE
OLD SOUTH BREAKWATER
SOUTH BREAKWATER
BREAKWATER EXTENSION
TO BE DREDGED
TORRY QUAY
TORRY HARBOUR
TORRY QUAY
MAITLAND'S QUAY
RIVER DEE DOCK
BAXTER STREET
ST WOOD STREET
ST FITTICKS ROAD
WALKER PARK
GIRDLENESS LIGHTHOUSE
ROAD
MANSFIELD ROAD
ABBEY PLACE
VICTORIA ROAD
THISTLANE ROAD

Scale of Feet
400 500 600 700 800 900 1000 2000 3000 FEET

Correspondence

To the Editor of "The Dock and Harbour Authority."

"Geodetic and Tidal Levels."

Dear Sir,—

I have read, with interest, Captain Shankland's article on this subject in the June issue of your Journal and I beg leave to make some comments on part of it.

1. Captain Shankland has given an account of the origin of Trinity High Water which is not in accordance with the facts revealed by documents dating from the beginning of the 19th Century. In a paper which I presented some years ago to the Institution of Civil Engineers and which you honoured me by printing in your Journal,* the origin, growth and errors of Trinity High Water were given in a fully documented account which has not so far been disputed. T.H.W., as it is now used, was not planned or designed, but was rather quite fortuitous and haphazard in its origin.

Captain Huddart did not sign the 1800 Certificate of the Trinity House, sent to the London Docks Company, nor did the Certificate contain any reference to high water and the reference to a correction " for the flow of the tide between the two points " did not appear until 50 years afterwards.

2. A much more serious point for comment, however, is that Captain Shankland has published an unjustifiable value for this old standard of level, in relation to the new Ordnance Datum based on Newlyn, thereby creating a *new* Trinity High Water and it is to be feared that the results of this action have not been appreciated. A new T.H.W. has not been authorised by any responsible body and if it is used by engineers and surveyors on the River Thames will certainly lead to confusion and clash of interest, and doubly so when it is represented as an equivalent of the old standard.

3. In my paper on this subject, I have shown that the old standard level must, by its definition, follow the errors, discrepancies and " waviness " which have now been found in the old Liverpool Datum.

Captain Shankland may, perhaps, consider that the new T.H.W. is in agreement with his estimate of the high tides of 1800, or 1820 or 1850, but if so, he has allowed himself to become involved in irrelevancies. Since about 1853 the only possible means of building engineering work to a definite relation to T.H.W. has been to use the Ordnance Bench Marks and to assume that T.H.W. is 12.53-ft. above Liverpool Datum. All parliamentary plans since that date have adopted this method and no other definition of T.H.W. can bear examination. Tidal changes since 1800 are, as stated, quite irrelevant.

4. The true equivalent height of T.H.W. in the Pool of London at Wapping, where it originated, is 3¼-in. *lower* than the *new* T.H.W. published by Captain Shankland.

At other places it may be more or perhaps less.

If your readers consult the new large scale map of the Wapping area published by the Ordnance Survey they will see a note stating that 1.4-ft. should be added to the bench-mark and ground levels given, in order to ascertain the equivalent height above the obsolete Ordnance Datum (Liverpool) in the area covered by that map. The converse is, of course, also true.

The equivalent therefore of 12.53-ft. above Liverpool Datum (at Wapping) is 11.13-ft. above Newlyn Datum, that is .27-ft. (3¼-in.) less than the new T.H.W. suggested by Captain Shankland.

5. When it is remembered that for about a Century, Acts of Parliament, flood embankment walls, low water datums used in charts, heights of bridges, depths of tunnels, depths of entrance locks, tidal records and so forth have been and still are tied to this " wavy " old standard of level, it will be appreciated by your readers how dangerous it is to introduce a new standard in this unofficial manner.

No owner, having constructed his works in good faith to the level of 12.53-ft. above Liverpool Datum, under statutory powers, would consent to making alterations to agree with an arbitrary new level.

6. Much more could be said to illustrate the dangers of allowing this new T.H.W. to come into use, but I cannot ask your indulgence any further. I may, hower, be allowed to refer to a practicable solution which I have developed in the paper referred to and may be summarised as follows:—

(1) Trinity High Water Marks must not been used for exact measurement of levels. They vary in level. For purposes not requiring exactitude they may be assumed as approximately 11-ft. 3-in. above Ordnance Datum (Newlyn) or 21-ft. 3-in. above London Zero Tide.

(2) London Zero Tide is a low-water datum 10-ft. below Ordnance Datum (Newlyn). It may be used as a chart datum and zero of tidal heights at such places between London Bridge and Shornmead Light, where it agrees closely with existing datums.

(3) Local Chart Datum may be used instead, at those places where London Zero Tide is not in close enough agreement with tidal averages.

Yours faithfully,

Whetstone, Wm. B. HALL, M.I.C.E.
London, N.20.
18th June, 1945.

* March, April, May, June, 1944.

Port of Swansea

Suggested Improvements

In the course of his recent address as newly-elected president of the Swansea Chamber of Commerce, **Mr. R. H. Lloyd** put forward the following suggestion for improvements at the Port of Swansea:—

Improved services for the supply of water to ships at the Queen's Dock, with local authorities taking steps to reduce their water charges for ships' use in order to make them more comparable with other general cargo ports.

Improved methods adopted to deal with passenger traffic at the port during the war, had proved that such traffic could be dealt expeditiously, and these could be carried still further in peacetime.

The need for an alternative sea entrance to the main docks had been emphasised during the war years, and with the very large type of tonnage now being dealt with, the single dock entrance, feeding three docks, had been taxed to the limit. The present single entrance was not a "square deal" to the shipowners utilising the port.

Additional warehouses were needed at the docks and steps should be taken to create cold storage accommodation, a most important adjunct to a liner port.

A war facility which was made possible in the period preceding " D " Day was the bunkering of overseas vessels at the King's dock with oil fuel. It was to be hoped that such a facility would be maintained.

Mr. Lloyd also said that the port was now undoubtedly fitted to cope with any general cargo demands that might be made upon it, either in import or export traffic, and it was to be hoped that a proportion of the trade which had come to it of necessity during the war would be retained.

Honours for Port Officials.

In the King's Birthday Honours List, a Knighthood is announced for Mr. Robert Letch, formerly Regional Port Director, North Western Area, later Scottish Area, Ministry of War Transport; and Mr. Leslie Ewart Ford, Chief Docks Manager, Cardiff, Great Western Railway Company, has been awarded the O.B.E.

Development of Port Trading Estate.

A joint report of the Docks Committee and the Planning and Reconstruction Committee of the Bristol City Council recommends the development of the trading estate at Chittening with the expenditure of £175,000 on roads, bridges and sewers, and £100,000 on railway bridges and services. The estate provides sites for industries and commercial undertakings not necessarily confined to users of the Port of Bristol.

Notes of the Month

Institution of Civil Engineers.

Sir Peirson Frank, Chief Engineer of the London County Council, has been elected President of the Institution of Civil Engineers for 1945-6.

Expansion of Swedish Port.

There is a project in hand by the Gefle Town Council to extend the harbour at a cost of about 18 million kroner. The scheme includes the construction of a deep-water quay, one kilometre in length, in the outer harbour for the use of the export trade.

Floating Docks for the Pacific.

Several floating docks for use by the Royal Navy in the Pacific have recently been constructed in South Africa, the first being built at Cape Town and completed within 13 months. It was built entirely of South African materials by South African engineers.

Roumanian Port Repairs.

It is reported from Galatz, Roumania, that the Docks Administration have in hand the repairs to the electric cranes at the port damaged or destroyed during the German occupation, and that these will shortly be completed. The Port of Braila has not suffered in any way, and there is only some minor damage at the Port of Constantza.

Association of Consulting Engineers.

The report of the committee of the Association of Consulting Engineers, for the year ended 30th April last, shows that the membership of the Association now stands at 188, the highest in its history. The committee record the activities on which they have been engaged during the year, particularly as regards model agreements and professional indemnity insurance.

Port Congestion in Colombia.

Recently there have been reports of congestion at the Port of Cartagena, Colombia, due to the diversion of maritime traffic from Barranquilla, which was closed to shipping for some weeks at the end of last year by reason of insufficient depth in the approach channel. All vessels arriving at the Caribbean coast of Colombia were compelled to discharge at Cartagena, resulting in an accumulation of cargo too great for the shipping companies and railways to handle.

War-time Achievement of the Port of Glasgow.

In the course of an address to the members of the Clyde Navigation Trust on June 5th, Mr. William Cuthbert, the chairman of the Trust, stated, " that in the handling of cargoes coming to the Clyde during the war, the Port of Glasgow tackled some 90 per cent. Glasgow war tonnages of cargo approached a ton per head of the population of Great Britain. That represents a quick turn-round of a large fleet of shipping." He also mentioned that improvements in the harbour, costing about two million pounds, were undertaken in such a way as to interrupt day-to-day working of the port as little as possible.

Increases in Port Rates.

Replying to a question on May 30th in the House of Commons, Captain G. E. P. Thorneycroft, on behalf of the Minister of War Transport, said that port rates on goods at the Port of London have, since January, 1943, been increased from 100 per cent. above pre-war to 200 per cent. above pre-war. In the case of other charges made by the Port Authority, the present increases range from 7½ per cent. to 100 per cent. above pre-war.

At Liverpool, the increases above pre-war are approximately: Dock rates on goods 31½ per cent., dock rates on vessels 39 per cent., harbour rates on vessels 87½ per cent.

The rates and dues at Hull are 20 per cent. above pre-war, except those on certain coasting liners and their cargoes, which are 7½ per cent. above pre-war.

Resignation of Ship Canal Director.

Sir William Bradshaw has recently resigned from the directorate of the Manchester Ship Canal Company.

Port of Tel Aviv.

The Port of Tel Aviv, Palestine, states the *Zionist Review*, is on the point of re-opening. Enquiries have been, and are being, made in Great Britain by a port officer regarding the most up-to-date methods and appliances for cargo handling.

New Floating Dock at Los Angeles.

A new 18,000 ton floating dock has recently been installed at the Port of Los Angeles by the Los Angeles Shipbuilding and Dry Dock Corporation. The dock is in three sections and when towed into position had the two end sections docked on the main section.

Saldanha Bay Harbour.

The natural land-locked harbour of Saldanha Bay, some 60 miles north-west of Cape Town, South Africa, was utilised to great advantage during the war as a highly important convoy assembly base. It is stated that in view of the improvements and facilities which have been provided, it will become the headquarters of the Naval Training College in South Africa.

Clyde Navigation Trust Appointments.

The following appointments to its various committees have been approved by the Trustees of the Clyde Navigation Trust, viz.:—Mr. Daniel J. Stewart to General Purposes; Sir A. Steven Bilsland, Bt., to Law and Parliamentary Bills; Messrs. James Gilchrist to Finance and to Workshops and Mechanised Appliances; Alister M. Macphie to New Works and Maintainence of Harbour; and Peter Baxter to Stores.

Presentation to Port Official.

Recognition was shown of the valuable service rendered by Mr. E. J. Weare to the Port of London and the Association of Master Lightermen and Barge Owners of the Port when a presentation was made to him recently, consisting of a testimonial and a handsome cheque. Mr. Weare had just completed 21 years in the service of the Association, for a considerable part of the time acting as secretary. Tributes were paid to him, amongst others, by Mr. W. L. Wrightson, Chairman of the River Committee, and Sir Douglas Ritchie, General Manager of the Port Authority.

Scarborough Harbour Silting.

The North-Eastern Sea Fisheries Committee, at their quarterly meeting in York, on May 30th, agreed to support representations to the Ministry of War Transport for a grant to purchase a dredger for the clearing of Scarborough Harbour, which is in danger of being closed to all but the smallest cobles at low tide.

Alderman J. Catchpole, of Scarborough, said there was much concern about the condition of the harbour, which, owing in large measure to war use, was in danger of becoming completely silted up.

Pilferage at Australian Ports.

Reports having been published in the Australian press about pilferage at the various ports, with an allegation that Melbourne was the worst case in the Commonwealth, the charge against Melbourne has been contested by Mr. A. D. Mackenzie, chairman of the Melbourne Harbour Trust. He asserted that the Port Authority were confident that Melbourne was a safe port and that, though it was known that pillaging was on the increase, such increase was world-wide and due to conditions brought about by the war. It has been pointed out in shipping circles that, as recently as 8th December last, Mr. Norman Kingsbury, the Executive Member of the Central Cargo Committee, stated in Sydney that Sydney had the worst reputation of any port in Australia for thieving.

Methods of Levying Charges for Services to Shipping

*Discussion by the Institution of Naval Architects**

(Concluded from page 44)

Rear-Admiral H. L. Vickery, U.S.N.: This paper is of great importance and is at this time the subject of considerable interest in the United States.

The author stressed the importance of obtaining a fair comparative chargeable "yard stick" between ship and ship in order to eliminate the technical effort to beat the rules which, as he so correctly states, "does not result in any advance in the science of naval architecture." The simplification in the method of admeasurement as advanced by him would undoubtedly eliminate many of the faults of the present gross-nett tonnage system. Because of the vast scope of the subject and the many intricate correlated subjects involved one cannot make specific comments on such a subject without a complete and thorough investigation. Such an investigation is now being made with great interest.

The author is to be congratulated for his enlightening presentation of a most important subject.

Mr. J. Douglas Calder: The author is to be complimented on his concise summary of the various methods of assessment for payment of services to shipping. It is so comprehensive and clear that little comment is needed. In so far as "capacity to pay" is concerned, this aspect of charges does not concern those interested in arriving at a more reasonable and logical bases of assessment. The taking into account of "capacity to pay" is a matter of policy for the particular port affected, and can best be handled by means of rebates on the scheduled charges.

The only practical standard by which to judge a new proposal is to find out how it works in practice. If it is equitable as between one ship and another, and if it is reasonably simple and straightforward in its application, then a case for it has been established.

In order to ascertain how far the formula proposed in Section 5 of the paper satisfies these requirements it was applied to over one hundred different vessels. The types examined included coasters, cargo vessels, cross-channel vessels, ordinary passenger and cargo liners, and express liners. Time did not permit of the investigation being extended to cover other types such as tankers, trawlers and tugs.

The results of the investigations are shown in Fig. A on which "Rateable Lengths" are plotted on a base of L.B.P., and as percentages of L.B.P. on the same base. The most striking feature of the incidence of "Rateable Length" is the manner in which it penalises small vessels. The extreme cases examined were two types mentioned in the writer's verbal comments, viz., *Queen Mary* and a Clyde "puffer." As a comparison let it be assumed that a charge of £1 per ft. "Rateable Length" is levied in a particular port. Then, by reference to Fig. A will be seen that *Queen Mary* would pay just under 16/- per ft., L.B.P., while the 67-ft. coaster would pay 31/6 per ft. This disproportion continues, in varying degree, over the whole range.

Fig. B gives the average length of each class of vessel examined and shows, diagrammatically, the way in which the three factors in the formula influence "Rateable Length." In the diagram the disproportionate "weighting" given to draught and beam in the smaller types will be noted.

In Section 3, when analysing the operating costs of a port or canal authority, the author, rightly, puts Capital Charges first. However, to place the brunt of bearing these charges on the smaller vessels cannot be justified. Generally the smaller the vessel the less it should pay, proportionately, towards these Capital Charges.

In many cases Nature provides quite useable harbours for small coasting vessels, in which they lie aground and discharge, or load, into, or out of, carts and lorries on the beach at low water. Even in the case of many of the "man-made" ports, the entrance channels did not require any deepening, widening or straightening in order to accommodate coasters. Why, then, should they have to pay anything up to twice as much, per foot length, as the largest liners? The author lays some stress on the arithmetical consequences of levying dues on a tonnage basis. This basis does not seem so unfair when considered from the above angle. The capital cost of laying out a harbour for 600-ft. ships may well be more than 27 times as much as for a harbour for 200-ft. ships. Even after making full allowance for maintenance, service and administration charges, there can be no justification for changing the ratio from 1 to 27 to one of the order of 1 to $2\frac{1}{2}$, which is what would result from an application of the "Rateable Length" formula. It may be taken that generally the design of ships is governed by port facilities to a very much greater extent than the layout of ports is governed by the design of ships. The layout of ports is most often influenced by the class of traffic the controlling body wishes to attract. In view of the foregoing and the general acceptance of the view that the charges levied should be proportionate to the services rendered, there can be no case for unduly penalising any particular dimension.

The chief criticism of the "Rateable Length" formula, as proposed by the author, is that it is precisely those classes of ships, the beam and draught of which make no appreciable demands on the facilities provided by Port Authorities which would have to bear the heaviest charges.

If a "Rateable Length" formula is to be equitable, the "weighting" of the three factors would require to be drastically altered. The case for such a method rests on the simple fact that a ship occupies "x" feet of quay space, but as each foot of space at any one particular quay has, presumably, the same value, it is difficult to see the virtue in a formula which artificially expands the length of small ships while, at the same time, it contracts the length of big ships.

The ideal system of measurement would take into account the length of quay and also the amount of water space occupied. The formula $\frac{L \times B \times d}{\text{coefficient}}$ mentioned by Mr. Murray Stephen, seems to achieve this result much more equitably than any other. Table I, given hereunder, shows a comparison of existing nett tonnage, L.B.P., "Rateable Length," and the $\frac{L \times B \times d}{\text{coefficient}}$ values of ten representative vessels. The coefficient, 100, has been adopted because of its simplicity. To facilitate comparison the 142-ft. coaster has been taken as Unity.

TABLE I.

Type of Vessel	Nett Tonnage	L.P.B.	"Rateable Length"	$\frac{LxBxd}{100}$
142-ft. Coaster	1.00	1.00	1.00	1.00
244-ft. Cargo	3.58	1.72	1.49	3.38
346-ft. Cross-Channel ...	9.67	2.44	1.76	5.44
370-ft. Cargo	12.36	2.61	2.12	9.46
406-ft. P. & C. Liner ...	19.35	2.85	2.36	13.31
410-ft. Cargo	16.13	2.89	2.34	13.09
480-ft. P. & C. Liner ...	35.48	3.38	2.48	19.64
524-ft. Cargo Liner ...	34.94	3.69	2.91	24.46
582-ft. P. & C. Liner ...	64.52	4.10	3.00	27.43
640-ft. Express Liner ...	84.94	4.51	3.33	37.26

The coefficient of 100 yields "tonnages" to which present schedules of charges based on nett tonnage could be applied by percentage variation. As an alternative, and arising out of an examination of existing nett tonnages, it might be mentioned that a coefficient of 125 would yield "tonnages" closely approximating to present figures. For instance, taking 24 vessels of representative types and dimensions, the present aggregate nett tonnage was 165,910 tons. In the coefficient of 125, the aggregate was 170,573, which exceeds the present figure by only 2.8 per cent. The value of coefficient does not, of course, alter the ratios between ships which, from the above table, seem equitable.

* Reproduced by permission from the Jounral of the Institution. The Paper on this subject by Dr. John Tutin appeared in the issue of this Journal for October, 1944.

Methods of Levying Charges for Services to Shipping—continued

It is to be hoped that the suggestion made in Section 6 of the paper will be widely accepted and that the co-operative spirit of the author will be adopted by all others interested in this important subject.

The writer wishes to conclude by putting on record his thanks to the author for his most interesting paper.

Mr. M. H. Downes: Average Adjusters are not, of course, directly interested in this matter, but in the course of their work sometimes find it necessary to estimate dues chargeable in certain eventualities, and consequently they would welcome any simplification of the calculation.

There is a point touched upon but not dealt with in detail by

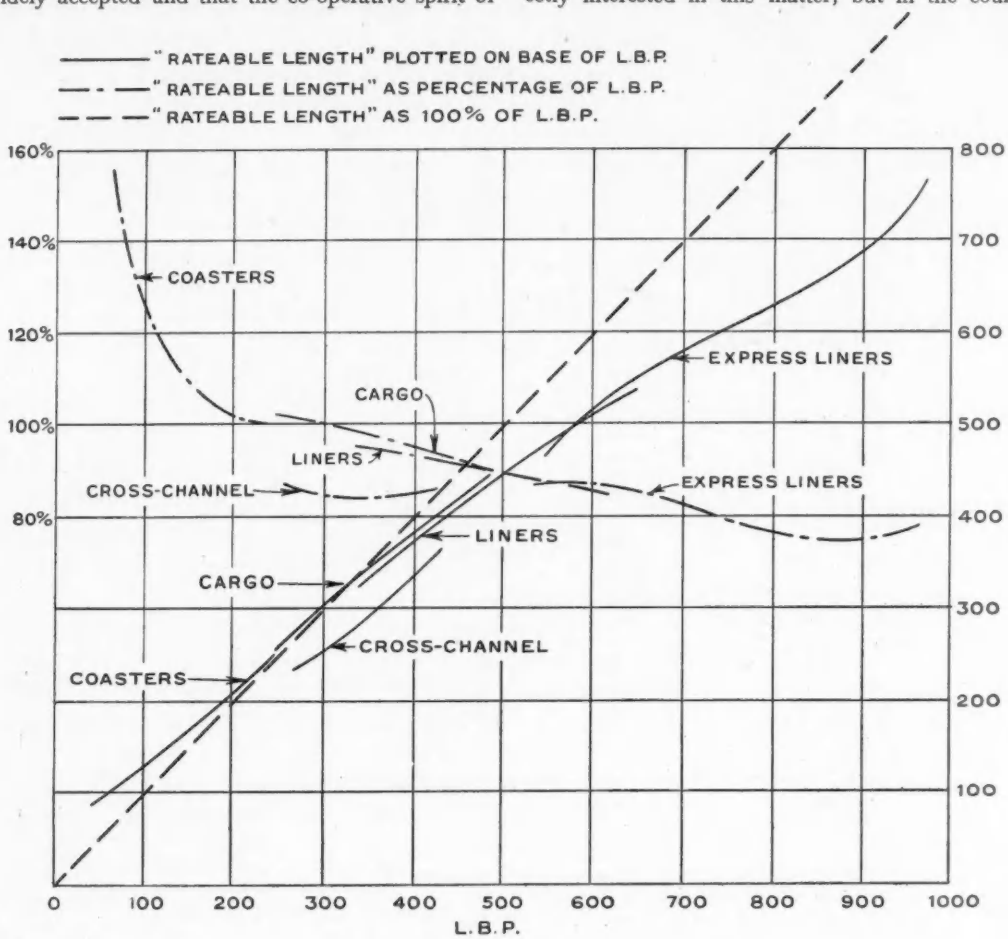


Fig. A

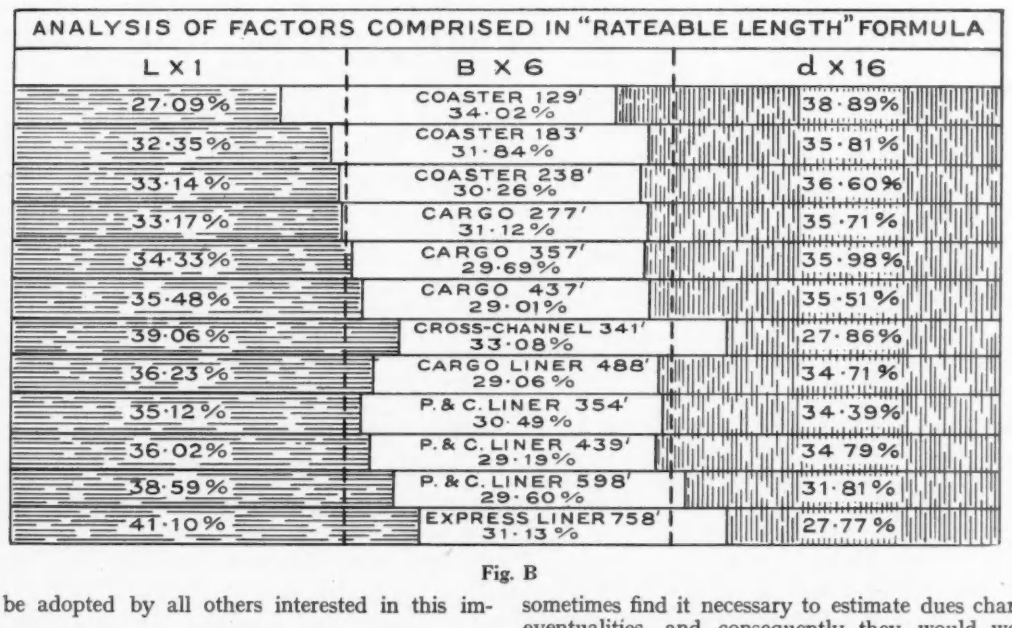


Fig. B

Methods of Levying Charges for Services to Shipping—continued

the author and that is the fact that the method of levying charges vary between ports. For instance, some ports (I should say the large majority) levy the ordinary port dues in the case of a vessel putting into a port of distress by a lump sum on entering; others, in addition to a comparatively small sum on entering, levy a charge on a day to day or month to month basis, and this difference of practice between ports is of interest to Average Adjusters, since it affects the treatment of the dues in general average adjustment. Where virtually the whole of the port dues are charged on entering, the shipowner is entitled to recover the full amount in general average, but where they are only partly charged on entering and partly on the period of time in the port, it is only the former charge that will be allowed. It is both unsatisfactory and illogical that a recovery in general average should be dependent merely upon the basis upon which port charges are levied by the port authorities, and if the ports in the minority cannot be brought into line, some alteration of the York/Antwerp Rules would seem to be desirable.

Author's Reply to the Discussion

The discussion very largely argues for itself. In Mr. Murray Stephen's Presidential address to the Institution of Engineers and Shipbuilders in Scotland on October 12th, 1943, he wrote:

> "The root of the whole trouble has been the principle on which the old tonnage laws were based, that is to say, the earning capacity of the ship. If the alternative principle, which is obviously the right and equitable principle to use, namely the cost of the services rendered to the ship, had been employed, the tonnage laws would not have have got into anything like the muddle in which they are to-day. Even if they were to be revised now, and if they were to continue to be based on the wrong principle, they would almost certainly get into a muddle again. I cannot too strongly emphasise that, in my view, it is this fundamental mistake of principle which has caused all the trouble and which will continue to cause trouble until it is altered."

As Admiral Land points out, there are two distinct problems:

Part A.—The establishment of a unit on which to base a rating.

Part B.—The establishment of rates per unit on which to base charges.

The present paper deals mainly with Part A, and "Rateable Length" is a unit derived from the "services rendered," approach rather than from the "capacity to pay" approach, e.g., quay-space occupied in lieu of cargo-space occupied.

When Part A is settled on a logical basis, Part B is mainly the concern of the Port and Canal Authorities, who can determine scheduled Rating Factors depending on the variables in which they are interested. They are not likely to adopt Rating Factors which will be unfair to customers, but at least they will be in a position to "start on the right foot" if Part A is on a logical basis, and they do not share the anxiety of some of the contributors to the discussion as to the adaptability of "Rateable Length" to port and canal charges.

Is it, then, really necessary "to sacrifice logic to expediency" as suggested reluctantly by some contributors, because, Mr. Murray Stephen points out, if we do this we may get into a muddle again.

On the important topic of selecting a rating basis which will not lend itself to artificial distortion of ship dimensions, some contributors appear to have overlooked the mathematical fact that with a cubic numeral as compared with a weighted linear numeral the scope of evasion is in the ratio 3 : 1, in fact with the latter, evasion would not pay. Incidentally it should be noted that the proposal to "weight" the three dimensions is solely directed to deter distortion, and it will be found that it is sufficient for this purpose if the coefficients chosen give approximately equal importance to each dimension, in other words there is no reason why coefficients, once agreed, should vary with the size or type of ship, as this effect will be taken care of under Part B.

An important consideration under Part B is the capacity of a given port to receive and service vessels. Suppose a port has a quay of 700-ft. in length, and this quay is occupied by (*a*) one 600-ft. ship or, alternatively, (*b*) three 200-ft. ships.

PROPOSED SCHEDULE OF RATING POINTS

Port Authority.....

Standard Point Charge.....

Ship.....

Rateable Length.....

	Rating Points	
	+	−
Port Dues		
Canal Dues		
Light Dues		
Pilotage dues :		
From.....to.....		
From.....to.....		
Towage dues :		
From.....to.....		
From.....to.....		
Miscellaneous Dues :		
Ship Type Differential.		
Cargo Type Differential.		
Cargo Size Differential.		
Rating Points Balance		

Port dues payable Rating Points Balance × Standard Point Charge × Rateable Length.

So far as the port is concerned, the quay is fully occupied in each case, but the revenue from the three smaller vessels, on a flat tonnage basis, is approximately only 10 per cent. of that if the berth is occupied by the single large vessel.

Alternatively, consider the case of a 700-ft. dry-dock occupied by (*a*) one 600-ft. ship, or (*b*) one 200-ft. ship.

On a flat rate tonnage basis the smaller vessel would pay only about 3½ per cent. of that paid by the larger vessel.

Is such an extreme disparity desirable from the point of view of either port owners or ship owners?

In reply to the query "why should small vessels pay for facilities provided for larger vessels?" surely the answer is that they will not necessarily do so, but if they occupy and use the same facilities as larger vessels there is a *prima facie* case for an assessment under Part A on a linear rather than a cubic basis.

If this is agreed, the nett charges under Part B become the responsibility of each authority concerned, and it is suggested that those authorities might deal therewith by issuing a schedule of "Rating Points," preferably integers, to cover their various local conditions and services. Such a schedule might conveniently be developed in the form indicated. The reference to the Schedule is at end of article.

Even if it were decided that in preference to Rateable Length, some other basis of assessment would be more acceptable, it is believed that a system on similar lines to the above might be applied with advantage.

Publications Received

The recently developed technique of **Welding Under Water** is explained in a brochure issued by Underwater Welders and Repairers, Ltd., of 52, Leadenhall Street, London, E.C.3. It indicates the advantages of the Peillon Process, which is carried out under water without the use of any external mechanical shield to protect the electric arc. The system is stated to be still in its infancy, but likely to grow to be of vast importance in many industries. Obviously, its most valuable application will be in the repair of damaged hulls of shipping without having recourse to dry docking. Port Authorities may find it of service in dealing with submerged defects in dock gates, buoy anchorages, marine salvage, etc. The field of usefulness in various directions is very wide.

*Dredging Machinery**

By HERBERT CHATLEY, D.Sc. (Eng.), M.Inst.C.E.

THE probability of large demands for dredging after the war makes it very desirable to survey the present position of dredging plant and dredging technique. In many harbours the world over dredging has been reduced or has been entirely suspended. Craft, even if not damaged by war, have deteriorated, whether used or not, and a certain proportion of them need to be replaced. Furthermore, rehabilitation and improvement to meet changed shipping requirements will make an intensive demand on dredging equipment. In many ports replacements are long overdue and repairs have had to be restricted to the minimum.

For all these reasons it may reasonably be expected that many new vessels will become necessary. Owing to the exigent demands for shipbuilding very little can have been done in respect to new construction, or even new design, since 1939, whilst between the two wars there were no very outstanding developments of dredging appliances, except in regard to sea-going suction dredgers.

Technical Records

In 1917 Mr. William Brown, M.Inst.C.E., gave an excellent summary of the then position of dredging plant.* Many of the vessels he described no longer exist. In 1935 Sir Henry Japp gave an Institution Lecture to Students, "Modern Methods and Plant for Excavation," which described many of the dredgers built between 1917 and 1935. From 1935 to 1939 several large suction dredgers were built.

In 1944, Sir George Mowlem Burt, M.Inst.C.E., touched lightly on the subject of dredging plant in a Paper† presented to a Joint Meeting of The Institution and the Institution of Mechanical Engineers.

Some further notes on the bibliography of the subject are given in Appendix I, *post*.

Developments Between the Wars.

The major developments since 1918 may be summarised briefly as follows:—

(1) Increased average size of new units to meet growth in the tonnage and draught of shipping, but nevertheless without surpassing the dimensions which had been previously attained by individual vessels. Even now the Mersey sand dredger *Leviathan*, built in 1909, remains practically the largest dredger in existence, although closely rivalled by the *General Goethals*, a trailing suction dredger built in 1938.

(2) Substitution of Diesel engines for steam plant in certain cases.

(3) Some increase in the use of Diesel-electric drive.

(4) Extensive use of welding, especially for repairs.

(5) Use of better special alloys for cutting and wearing parts.

(6) Extended use of the Fruehling drag or trailing principle to sea-going suction dredgers working on open bars and the application of the Guilloux principle of twin flexible side pipes to such dredgers.

(7) Drag-line gear applied increasingly for shallow dredging.

(8) Installation of fuel-economy devices in steam plants.

(9) Special forms (for example, level-cut grab buckets).

(10) Refinements of detail in mechanical gear.

Newly Developed Ports

It is, of course, in newly developed ports that one would expect to find the most modern equipment, because the life of dredging plant is quite considerable and many of the older ports retain costly items so long as they give service that is at all adequate without excessive repair. Some iron-hulled dredgers in their "fifties" are in fact still working.

Port of Shanghai.—Shanghai, on the Whangpoo River and approached from the sea via the enormous estuary of the Yangtze, supplies an interesting example of such a modern port. By means

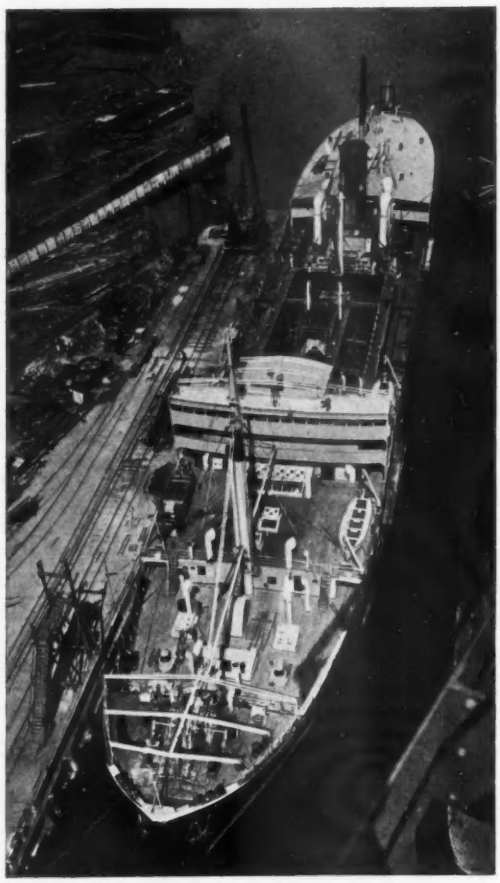


Fig. 1. "Fu Shing" at Fitting-out Berth at Danzig

of dredging and training works the River Whangpoo, formerly unnavigable by large ships, was made accessible up to above Shangnai for vessels with draughts of up to 32-ft. between 1906 and 1921; and in 1931 dredging in the Yangtze estuary was commenced with a view to providing a 27-ft. draught on the bar at low water of spring tides.

In 1936, the last year in which work was free from military or political interruption, the output for the year of the Whangpoo Conservancy Board's dredging plant was nearly 8,000,000 cubic yards, namely, 2,700,000 cubic yards in the Whangpoo itself and 5,100,000 cubic yards in the Yangtze, the latter all being achieved by one dredger, the *Chien She*, which was described by the Author in 1939.* A second, more powerful drag-suction dredger, the *Fu Shing*, was built in 1937-1939, but owing to the war has never left Germany (Figs. 1 and 2). On her builder's trials in the

* Paper read before the Institution of Civil Engineers and reproduced by permission from the Journal of the Institution, April, 1945 (No. 6).

* "Recent Progress in Dredging Machinery," Minutes of Proceedings Inst.C.E., vol. cciii (1916-17, part i), p. 212.

† "Machinery and Plant in Connection with Civil Engineering Construction," Journal Inst.C.E., vol. 22 (1943-44), p. 128 (May, 1944).

* "The Principles of Drag-Suction Dredging," Journal Inst.C.E., vol. 12 (1938-39) p. 185 (June, 1939). See also "The Dock and Harbour Authority" for August and September, 1937 (vol. xvii pp. 278 and 308).

Dredging Machinery—continued

Baltic it appeared certain that she would exceed the output of the *Chien She*.

In 1936 the Whangpoo River fleet consisted of the following thirteen vessels:—

Three large (23 cub. ft. buckets), dumb bucket dredgers.
Two small (about 4 cub. ft. buckets), dumb bucket dredgers.
One very small (about 1 cub. ft. buckets), dumb bucket dredger.
Four medium (1½ cub. yd. grab), dumb grab dredgers.
One small (¾ cub. yd. grab), dumb grab dredger.
One small pipe-line suction cutter dredger.
One small jet erosion dredger.

together with

Two large reclaimer pumps for emptying barges.
Twenty-six mud barges:—
Six at 110 cub. yds.
Two at 270 cub. yds.
Seventeen, 350-380 cub. yds.

(All dumb, 8 with doors, but all usable as transporters for pumping out).

One at 110 cub. yds., self-propelled, with doors.
Eleven tugs, ranging from 250 to 410 indicated horse-power.
Eight inspection and service launches.
Three coal barges
Sundry auxiliary items.

The material dredged was almost entirely firm mud (density 1.8) and in 1936, 80 per cent. of the spoil was put ashore into reclaimings behind mud dykes. In earlier years the proportion pumped was higher, and in many years 100 per cent.

From 1906 to 1936 about 42,000,000 cub. yds. in situ was dredged and was used almost entirely for reclamations of foreshore or the raising of riparian land.

In the first 10 years the plant consisted of Dutch contractors' bucket dredgers, hoppers, tugs and reclaimer, but after early in 1916 all the Whangpoo plant, with one small exception, was departmental and built at Shanghai or at Osaka (latter, three items only). The large bucket dredgers were of the gear-driven type and owe their design predominantly to Clydeside-trained engineers. Fig. 3 shows the working end of one of the latest. The mechanism of the grab dredgers was imported (Fig. 4).

Some details of the whole plant of the Board are given in Appendix II, *post*.

Particular attention had to be given to quayside dredging, to shallow maintenance dredging on convex shores, and to redredging a channel in the Whangpoo's tributary, the Soochow creek. The last accounts for the small bucket dredgers, the very small one, and the jet dredger. The two unorthodox types were specially intended for working under low bridges, of which there are many across the creek.

The annual outputs were quite high, as the material could be easily dealt with and a 60-hour week was worked. The normal quantities were as follows:—

Output per Annum

22 cub. ft. dredger, 1,250,000 cub. yds. barge measure = 895,000 cub. yds. in situ.
Small bucket dredger, 150,000 barge measure = 107,000 in situ.
Very small bucket dredger, 25,000 barge measure = 17,000 in situ.
1½ cub. yd. grab dredger, 300,000 barge measure = 210,000 in situ.
¾ cub. yd. grab dredger, 75,000 barge measure = 52,000 in situ.
Small pipe-line dredger, 140,000 barge measure = 100,000 in situ.
Reclaimer pump, 1,400,000 barge measure = 900,000 in situ.

It will be observed that the ratio of barge measure to in situ excavation is 1.4 to 1.0, which is rather higher than such material is usually reckoned to give.

New Designs and Technology

Considerable opportunities should occur after the war for the development of new designs and new ideas in dredging. Whilst many of these will be in the nature of machine design, there is scope also for the application of physical principles to general proportions and arrangement, involving higher efficiencies.

The new sciences of Soil Mechanics and Rheology (study of flow) can make useful contributions in regard to the behaviour of the material excavated during the processes of cutting, expansion, and fluid suspension. Some advances have also been made with hydrodynamic investigations of turbulence and silt suspension, which have significance in regard to suction dredging.

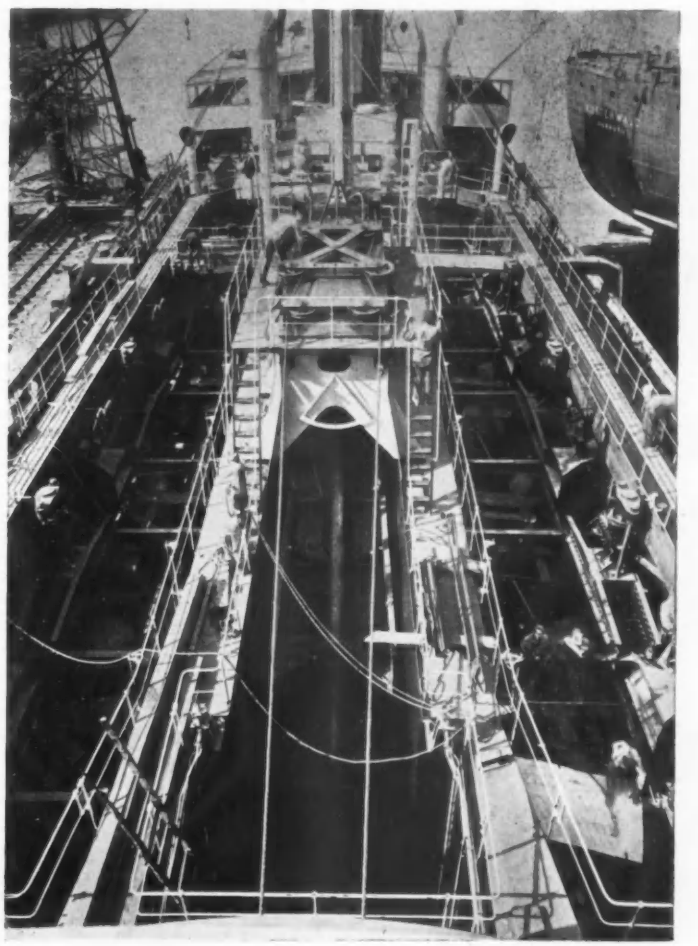


Fig. 2. "Fu Shing"—Hopper and Suction Well. Note Hydraulic Discharge Valves

There is, however, still much room for experimental study, both on a full scale and in models, of the forces required to cut different materials, the proper angles of cut, and the optimum conditions for liquefaction. The flow of mixtures in pipes and orifices and their stability as "fluids" in various conditions of velocity, the retention of material in, and ease of discharge from, variously shaped buckets at various angles, the grid resistance of "strums," the relative cutting-power of variously shaped lips, the resistance to abrasion and shock of cutting-edges, pipe and pump linings, and many other matters can provide an endless field for research.

On the design side there is the old problem of economical weight, especially for "positive dredgers," that is, bucket, grab, dipper and scraper types.

British practice has favoured heavy design, but the objection to this is that the self-induced stresses, friction, and shock, are rather high. Dutch practice, perhaps influenced by the frequent occurrence of rather easy getting material, has favoured light design in which the actual working stresses are paramount. This second approach is obviously preferable economically, provided breakdowns are no more frequent than with the heavy type, since prime

Dredging Machinery—continued

cost, power-consumption, and weight of spare parts are all reduced.

The use of metals with higher strength/density ratio is clearly indicated so long as they are within the possibilities of purchase.

Rheology

In this modern development, of which not so much has been heard by engineers as of Soil Mechanics, considerable importance is attached to "dilatancy" and "thixotropy."

The former (discovered by Osborne Reynolds) is the property of aggregations of particles of enlarging their effective or bulk volume when displaced from a "stable" arrangement. This can happen even if the disturbing force is a compression. Thus the area around a footprint in wet sand on the seashore dries while the foot rests on it and the footprint becomes wet when the foot is removed—both just the reverse of what might be expected to happen. Dilatancy is also illustrated by the high resistance to

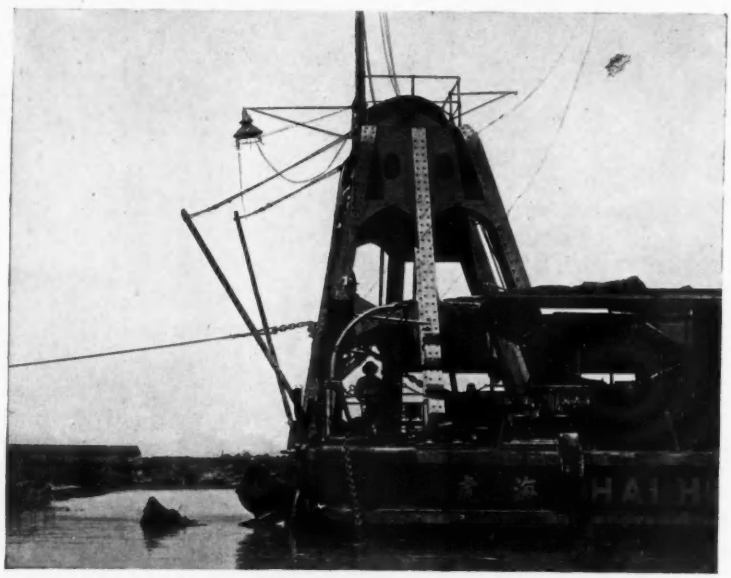


Fig. 3. Working End of Bucket Dredger "Hai Hu"

pumping which is presented by sand suspensions. It is a purely geometrical and mechanical phenomenon associated with the change of gear between the particles, which compels separation before shearing can occur: it tends to make the resistance to shear increase rapidly with velocity.

An unfortunate confusion has arisen with respect to the name of this process. "Dilation" is the expansion of a continuous material by *tension* or heating and is quite different from "dilatancy" (Reynolds called it "dilatation," but that word is now often used for "dilation"). "Dilatancy" is the expansion of a discontinuous aggregation due to the change of structure consequent upon *compression* or shear.

"Thixotropy" is the property of "setting" (without "settling") of "sols" (fluid suspensions of minute particles) into "gel" form (that is, quasi-jelly "solid" form). It is due to molecular forces between the particles and in the water films on those particles and is well illustrated by the behaviour of very fine grained mud jellies which can easily be made fluid but turn stiff when left still. It develops slowly when the material is quiescent and is one of the factors which makes mud much more easily pumpable than sand.

In a limited sense these two properties are characteristic of sand and mud respectively and express, if they do not always explain, the peculiarities of pumping these two materials.

Resistance to Cutting

The force required to cut a continuous material such as clay, mud, or soft rock may be compared with that necessary in dealing with metal or timber and, apart from the determination of the actual shearing forces involved, it presents no particular problem.

The case is, however, different with sand or loose aggregate the resistance of which depends upon

(a) the internal friction, grain on grain;
(b) the force required to change the grain structure in a thin sheet on the surface of rupture.

The latter is really a case of "dilatancy," as explained above. There is generally a local upward *expansion* of the grain spacing, which involves lifting the whole mass above the rupture surface a distance which is of the order of 1 grain-diameter, so that the effective shear resistance increases with the coarseness of the material. If it be imagined that in this process the alternate grains at the points of rupture rise and roll over the other immobile grains, it is clear that the vertical and horizontal velocities of the moving grains will be of the same order, so that the shearing force required will be comparable with the pressure of the weight of the material above the surface of rupture. Thus, if the co-efficient of friction is unity, for sands and gravels, the gross shearing stress in cutting will tend to be of the order of *twice* the pressure; for example, to shear a layer of coarse sand, weighing say 130 lb. per cubic foot, at a depth of 5-ft. may require a shearing stress of 1,300 lbs. per sq. ft. Under water, where the loading is reduced by the buoyancy of the sand, a stress of, say, 650 lbs. per sq. ft. would apply.

In fine materials with flat grains and relatively thick films of "fixed," but not rigig, water the resistance is much lower, and this case emerges into the case of "continuous" material referred to above. The cohesion in such material may often be appreciable and the co-efficient of internal friction small, so that the effect of thickness of the cut does not enter into the stress per unit area of the cut required to shear; but in both cases the area to be sheared through is a factor in the total cutting-force. The shape of the surface of rupture is usually slightly curved, but no great error is probable if it is assumed to be plane and rising at an angle which depends upon the material, somewhat like the plane of rupture in the case of "passive resistance" behind a retaining wall.

Abrasion

The wear of the faces of dredger parts working in sand-loaded woter and the scouring effect of the latter upon pipe linings and impeller blades has yet to be reduced to a satisfactory quantitative valuation. The resistance to abrasion of various steel alloys and the value of plastic or rubber linings in pipes are still matters for study. The cutting effects of mineral grains depend upon the hardness of the mineral, the shape of the grains, their molecular attraction for water, which determines the thickness of the attached water-films on them, and especially the mean diameter and velocity. The fact that, speaking broadly, a hard mineral such as silica does not diminish below a certain size in a water stream is indicative of the great strength and cutting power possessed by such grains. Sand-blasting practice could doubtless provide some data of value in connection with the wear of dredger parts, but the conditions in air and water are rather different. On the metallurgical side the distinctions between toughness and hardness need to be more clearly brought out. The behaviour of ropes, wires, and cables in sand-loaded water needs considerable investigation. Identity of tensile strength in new wire ropes, and even equality of elasticity, may be accompanied by great differences in resistance to abrasion and, as is shown by the case of rubber, quite low tensile strength may be accompanied by high resistance to granular abrasion.

Types of Dredgers

Digging or "Positive" Dredgers: Bucket Dredgers.—The bucket or "ladder" dredger remains the general favourite in Great Britain, although in the United States and Canada the dipper is preferred.

Although many of the Clydeside builders still favour the geared drive for bucket dredgers, there is quite a strong preference among

Dredging Machinery—continued

dredging contractors for the belt drive, on account of its elasticity. In mud the gear drive is quite satisfactory, probably on account of the elasticity and energy-absorbing quality of that material, but for general service in irregular and perhaps hard materials, the verdict seems to be in favour of the belt drive.

Optimum cutting-speeds have tended to rise towards twenty buckets per minute, doubtless owing to the improvement in metals, higher steam-pressures, and better forms of bucket.

Fig. 4. Grab Dredger "Hai Ngo"

Speaking generally, the bucket dredger has almost reached a standard form, but unfortunately has not quite done so. It would be an immense advantage if all the makers could get together and decide upon standard designs for such parts as links, pins, rollers, and even buckets and tumblers, so that these could be interchangeable.

The questions of self-propulsion and the provision of a hopper in the dredger are still somewhat open. For many purposes the plain pontoon type is much preferable, since the adoption of a ship form interferes with the disposition of the dredging machinery. Self-propulsion (using the same engines for propulsion as for dredging) is convenient for shifting a dredger, but the resistance to propulsion of a vessel with a split hull is high. If the well is at the stern, twin propellers are necessary, whilst if the well is forward the resistance to propulsion is high unless the well is closed at the bow—and in the latter case the dredger cannot cut her own flotation because the ladder cannot be lifted high enough. On account of the overside disposal of the spoil the head of the ladder must be high, the top gear is heavy, and so the metacentric height of the vessel is small. When travelling outside inland quiet waters it is usually necessary to lower the centre of gravity by removing some of the weight, and this involves considerable delay in the preparation for voyage and recommencement of dredging afterwards. Several dredgers have been built in recent years which can travel in moderate weather without this stripping; but this obviously involves a more substantial hull.

Another question related to the bucket dredger is its utility in disturbed water. Owing to the buckets touching the bottom a long way fore or aft of the centre of the vessel, the movement at the bucket when pitching occurs is considerable. This results in loss of cut when the bucket rises from the sea-bed with the ship and severe stresses on the bucket when the ship descends. This could be avoided if the latter could be disposed so that the buckets touched the bottom just under 'midships; but that arrangement entails a centre well of great length which presents serious difficulties in the general arrangement. Again, when the ship is rolling the transverse swing of the contact bucket about the metacentre causes severe stresses in the ladder. All dredgers find difficulty in loading into hopper barges when working in disturbed water, owing to the bumping of the two vessels against one another, so that if a bucket dredger is required to work in such water the need for a self-contained hopper arises. To provide a reasonably large fraction of working time the hopper in this case needs to be large, which implies a large hull with large and varying draught. On the whole experience is definitely against using bucket dredgers for working on estuarial bars unless the situation is such that wave motion rarely exceeds, say, 2-ft. of vertical range.

In the United States the bucket ("ladder") dredger is almost unknown except for mining purposes, the dipper having proved more acceptable.

Dipper Dredgers.—Just how far the preference in the New World for the dipper over the bucket dredger is a matter of fashion and custom is not quite clear. Since the bucket dredger has a speed of, say, sixteen buckets per minute, and dippers very rarely reach two cycles per minute, it follows that for equal output a dipper bucket must be of the order of eight or more times the effective capacity of a ladder bucket. Hence a dipper, to produce the same quantity as a bucket dredger with 27 cub. ft. buckets, needs at least an 8 cub. yd. bucket, with all the disadvantages of balancing and controlling the corresponding large weight cantilevered out. Spuds are usual with dippers and, although these are excellent in effect in many cases, when the depths of water are great the spuds must be very strong and heavy and require powerful winches to hoist them. The length of the dipper-"stick" and the overhang of the "A" frame for deep dredging similarly involve heavy construction, so that on the score of size and cost the bucket dredger is probably cheaper. On the other hand, the dipper can certainly tackle certain difficult jobs which a bucket dredger finds awkward, such as the handling of hard boulders. The enormous force which can be applied to the cutting edge of a dipper bucket is of great advantage in dealing with obstinate material.

The large weight of the individual bucket load is rather a problem with dipper dredgers. Obviously hoppers to receive at one time 8 cub. yds. of material, weighing perhaps 10 tons, must be very substantial.

Grab Dredgers ("Grapple" Dredges; Clam-shell, and Orange-peel Buckets).—For general all-round service when moderate outputs are required the grab has held its own well, especially for jobs in confined spaces, working close up to wharves and other structures, and in dealing with varied material such as harbour trash or structural debris. The difficulty of making the cut even has been partly met by the level-cut grab bucket (Fig. 5), but for hard or "runny" materials the lack of penetrating power and limited ability to provide a tightly-closed container are still matters

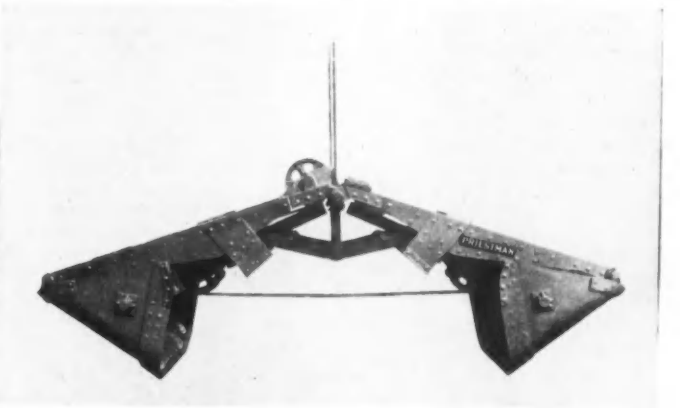


Fig. 5. Level-Cut Grab Bucket

which restrict the efficiency of this tool in certain conditions. Here again the questions of self-propulsion, self-contained hoppers, spuds, etc., all arise. Speaking broadly, the single-grab pontoon dumb type is the most generally useful. The Author has had no experience with the multiple-grab hopper dredger, but it is praised by many engineers and doubtless is well suited to certain cases.

(*To be continued*)

Relaxation of Regulations at Canadian Ports.

Steps have been taken for the release of Canadian Atlantic ports from all protective measures in force during the European war.

Greymouth and Westport, N.Z.

Improvement Projects at Two New Zealand Harbours

The ports of Greymouth and Westport on the Western side of South Island, N.Z., are alike troubled, among other things, by inadequacy of entrance depth due in a large measure to siltation and coastal drift. The situation at each port has recently been investigated by engineering experts and we are indebted to the *Wellington Evening Post* for the following summaries of the reports made to the respective harbour boards:—

I.—GREYMOUTH

The report, which was prepared by Messrs. J. Woods, D. Holderness and T. A. Johnson, states that the moles and their various extensions exhibit marked evidence of deterioration as a result of heavy seas. The half-tide retaining walls are in a deteriorated condition and required building up to a proper height, as they form an integral part of the scheme of channel improvement. There is continuing deterioration of the tidal compartment on both the northern and southern sides of the harbour.

It would appear that, despite the fact that all the engineers who have reported on means of improving the harbour have urged the necessity of preserving and increasing the tidal compartment, no serious practical efforts have been made towards this end, states the report. A close study of soundings taken in the roadstead since the earliest recorded observations of 1874 indicates that the accretion of sand south of the harbour entrance, brought about by the projection of the moles into the sea, is reaching a stage where little further change is to be anticipated unless and until it may be decided to extend the moles in an effort to increase the navigable depth into the harbour.

With its narrow entrance and exposed position, there have always been, and must continue to be, occasions when it is not safe for vessels to enter or leave port .

Effect of Scend

Evidence was received regarding the effect of scend produced by waves entering the harbour through the moles and proceeding up the river to the shipping berths. Under present conditions, it was stated that at times the scend at the lower berths was as much as 2-ft. Serious thought should be given to any works contemplated which might tend to increase the scend at the berths.

In so far as berthage and equipment are concerned, the committee was impressed with the need for considerably greater expenditure on maintenance, general upkeep, and replacement, but means will have to be found to increase substantially the revenue available if the port and equipment are to be saved from progressive decay beyond the stage of safety and utility.

Depth on Bar

Apart from the question of maintenance, the problem at Greymouth is to ensure an adequate depth of water on the bar to enable shipping using the port to enter and leave with a minimum of delay or danger.

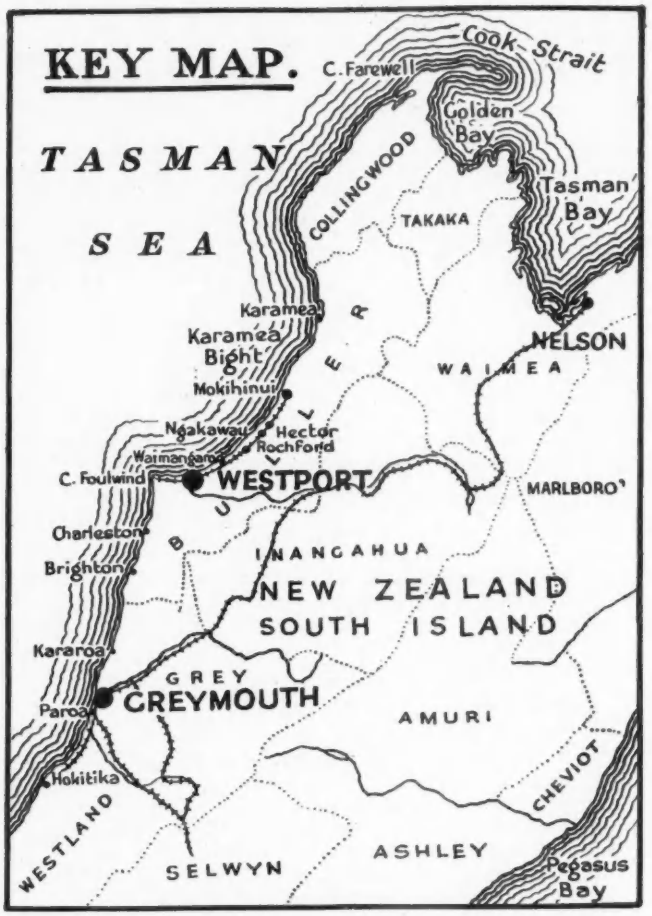
Opportunity was taken to examine briefly certain proposals which had been put forward for the construction of a new harbour away from the river, but, in view of definite instructions, the committee does not comment upon such proposals. It confined itself to the question of works of urgent priority to effect improvements in the interests of shipping and the restoration of the harbour as far as is practicable to conditions suitable for normal trading.

There are in general four methods by the use of which, either independently or in combination, the depth of water may be improved: (1) An alteration in the location and the length of the moles; (2) an improvement in the tidal compartment so as to direct a greater volume of water at sufficient velocity on to the area where the bar tends to form; (3) the building of groynes some distance south of the river to trap sand travelling northwards along the coast; (4) continuous dredging to remove the send deposited.

Dredging Impracticable

At Greymouth the last-named method, even for specially-designed dredges, is incapable of application unless the moles were carried out into much deeper water and reconstructed so as to provide a wider waterway. Any appreciable widening of the river would so reduce its velocity as to render it impossible to maintain an adequate depth for existing shipping.

Having in mind the purely temporary nature of any relief to be expected from the erection of groynes, their cost, and other relevant factors, the committee is not prepared to recommend the construction of works of this nature as a means of improving conditions at Greymouth.



The opinion is expressed that the navigable depth on the bar has been prejudiced by the fact that the south mole has an overlap beyond the end of the north mole, thereby permitting the escape of the river current northwards and dissipating the force of the river before the end of the south mole is reached. It is considered that the moles should be of the same length.

The harbour entrance is considered too narrow for reasonable safety and the committee agrees with the board's engineer (Mr. D. S. Kennedy) that any further extensions should provide a width of 450-ft.

Committee's Recommendations.

The committee's recommendations are summarised as follows:

(1) The extension on the existing alignment of the north mole for 500-ft. and the south mole for 400-ft. at an estimated cost of £180,000.

(2) The excavation of the Cobden Lagoon at a cost of £55,000.

(3) The excavation of the southern lagoons at a cost of £180,000.

Greymouth and Westport, N.Z.—continued

(4) That the above works be carried out by contract and be started as soon as plans and specifications can be prepared and tenders called.

(5) That suitable arrangements be made by the Board to increase its revenue.

(6) That arrears in maintenance of existing works and equipment be overtaken as soon as possible and thereafter be kept up to date.

The Board deferred consideration of the report till a further special meeting.

II.—WESTPORT

The construction of a groyne approximately half-a-mile long at Tauranga Point, Westport, and the speeding-up of existing dredging till the effect of the groyne becomes substantial at the bar, is recommended in a report by Mr. F. W. Furkert, former Engineer-in-Chief, Public Works Department, on methods of improving the harbour at Westport. In the event of that work being delayed, the he advises the enlargement of the tidal compartment. Intensive dredging at the harbour entrance and the improvement of the tidal compartment are recommended in another report, prepared by Messrs. J. Wood (chairman), D. Holderness, and T. A. Johnston. Both reports have been released by the Minister of Marine (Mr. O'Brien).

The Furkert report holds that the courses open to the harbour authorities are as follows:

(a) Obtain a much larger dredge. The additional annual costs to the harbour account would be £8,000, but the result would be no marked average improvement. (b) Enlarge the tidal compartment, additional annual costs £9,350; result, 2-ft. extra depth and less dredging. (c) Extend the mole 1,000-ft., additional annual costs £19,250; result, 4-ft. extra depth to start with, reducing to nothing in 30 years or perhaps even in 20 years. (d) Put out a master groyne at Tauranga Point, additional annual costs £10,000; result, 4-ft. extra depth for probably 100 years.

A further suggestion is to do nothing to the harbour, but to alter the type of vessels trading to ships with a draft approximate to the depth available. Such, however, would not be a permanent solution. There would be no additional annual costs, but the result would be that no large vessels could come for bunkering.

Improvement Gradual

"Assuming the master groyne idea to be seriously considered, it remains to see how this will affect the port of Westport," says the report. For a time little or no effect would be noticeable, as all the drift material which had passed Tauranga Point would continue on its way, and till a large proportion of it had passed the Buller mouth the present bar conditions would continue, but immediately the stream of sand began to slacken, decided improvement would be evident. It would no longer be necessary to carry out regular bar dredging, though after a flood in the Buller which brought down much detritus, it might be advisable to clear off the top of any deposit which restricted the channel depths without waiting for Nature to move it on, as would undoubtedly soon be the case. Shortly, the report added, the conditions would be as good as, and perhaps better, than they were in 1917-18, before the sand began to pass round the last mole extension.

Whichever of the recommended schemes were followed, considerably more expenditure than had been utilised in the past was called for. The river dredging should be increased and should include room for vessels of 430-ft. to swing opposite the coal wharf. This swinging area would not be required if the floating basin idea were proceeded with but as there seemed no difficulty in handling all the trade at the present wharves there seemed little justification for going on with the floating basin work till it was seen how the bar improvement affected the future trade.

Assuming that recommendations (b) and (d) were proceeded with, the annual charges were equal to £13,093 overage for the first six years, £17,750 for the following 25 years, and £1,750 for the following 20 years. Taking the coal output as 500,000 tons a year, an additional charge of 9d. a ton would more than meet the cost of the works, till 1975, and thereafter 1d. a ton.

Dredging Favoured

The report of Messrs. Wood, Holderness and Johnston expresses the opinion that there is quite sufficient travel of sand to continue accretion, both at Tauranga Bay and at Westport simultaneously if groynes or breakwaters were erected or extended at both places, and doubt is felt whether the building of the suggested groyne would prevent said deposition at the mouth of the Buller River. The two methods of improving the harbour recommended are intensive dredging on a comprehensive scale at the harbour entrance and the improvement of the tidal compartment.

"In summarising our recommendations and conclusions, we express our opinion that improvement by dredging is a much more certain and positive method than any other that can be devised," concludes the report. "To obtain any real improvement by the extension of the breakwaters an expenditure of at last £400,000 is involved, and within a very limited number of years, to maintain the improvement, further extensions as an alternative to dredging will be required.

"The erection of a groyne will cost at least £250,000, and it is doubtful if any real improvement can be obtained by this method, but even if it were, the improvement again would last only for a limited time. We can only see that by these methods there will be a piling up of ever-increasing debts and annual charges and we feel sure that in the long run the costs of improving the port by the acquisition of two powerful dredges will be very much less, and give considerably more relief than by costly and doubtful marine works."

Breakwater extension or other works could not effect any improvement for two or three years, and if the dredges could be obtained within three years, relief could be given sooner than by alternative work. Further, if the dredging were carried on intensively for some years by powerful dredges, so great a quantity of sand could be removed from the entrance that one of the dredges could be withdrawn for some time or at intervals, thus reducing the cost of maintenance of the harbour, and enabling the Government to hire the dredge for harbour works in other localities.

Congestion at Australian Ports.

In a Notice to Shippers regarding outward cargo from the United Kingdom to Australia, the Australian Conference Lines point out that the congestion of cargo at Australian ports is increasing owing to the non-arrival of invoices and other documents necessary for the clearance of cargo. As a result, there is confusion, delay and expense to consignees and others.

Shippers are urgently requested, immediately their goods are called forward for shipment, to send to the care of the loading brokers an invoice, pro-forma or actual, in a stamped envelope addressed to consignees, for inclusion in the ship's bag. It is also suggested that the 6d. air mail letter form should be used as a means of giving consignees early advice of essential details in connection with consignments that have been shipped. If this is done, together with full use being made of the ship's bag for invoices and bills of lading wherever possible, much delay and inconvenience will be avoided to all concerned.

Trade Revival at Port of Stockton-on-Tees.

At a meeting of the Tees Conservancy Commission on April 4th at Middlesbrough, Alderman W. Newton championed the future of the Port of Stockton.

"Stockton as a port is not decaying, it continues to revive," he declared, in protesting against the recommendation that in future the Stockton office of the Commission should be open from 9 a.m. to 12 noon and, when conditions returned to normal, the appointment of a full-time collector of dues at Stockton should be considered. An amendment moved by Alderman Newton and seconded by Councillor J. Stoddart to the effect that the office "should be kept open at such other times as are considered necessary" was carried.

Alderman Newton said that before the war Stockton Quay was looked upon as a white elephant, but it had revived; and, having confidence in its future, Stockton Corporation had spent £20,000 on improvements.

Co-ordination of Harbour and Dock Administration

Observations in Address by Sir Cyril Hurcomb, K.C.B., K.B.E., Director-General of the Ministry of War Transport

In his Commemorative Address, in March last, to the Institute of Transport on the occasion of the twenty-fifth anniversary of the foundation of the Institute, Sir Cyril Hurcomb made the following allusion to

Harbours and Docks

I have already referred to the concentration of powers relating to harbours and docks in the combined Ministry. All these functions are at present administered by a special division known as the Port and Transit Control, which also has had to deal with a vast number of problems affecting shipping and the turn-round of shipping in most ports of the world and is the direct link between the Ministry and the Ministry's representatives abroad. In this country, effective co-ordination of port facilities and inland distribut.on has been secured locally through Regional Port Directors (in the Clyde, Mersey, Bristol Channel, Humber and on the North East Coast, and during the invasion period in London), the Port Emergency Committees and the Ministry's local shipping representatives.

The fact that the Department found it necessary to appo.nt Regional Port Directors may prompt the question whether, in our post-war organisation, some regional consolidation of the harbour and dock authorities would be advantageous. There are over 300 separate dock and harbour authorities in the United Kingdom. Their constitutions in many cases date back to the early days of the nineteenth century or even further and are, in some cases, cumbersome or out of date. There is no consistency and sometimes little logic in the allocation of the functions assigned to the harbour authorities themselves. In many areas responsibility for pilotage or conservancy is assigned to a separate statutory authority, so that the powers and duties of the port authorities vary greatly between one port and another. In some ports the authority itself owns the docks, quays and wharves; in others many of the quays and wharves are privately owned. There is consequently also a considerable variety in arrangements relating to stevedoring and warehousing.

Then again the actual ownership of the ports is of several types. Many important ports are in the hands of the railway companies. Others, including London, the Mersey and the Clyde, as well as a large number of smaller ports, are in the hands of public trustees or boards, not managed for profit and financed entirely by loan capital. The Manchester Ship Canal is an interesting example of the mixed undertaking which is more popular in some Continental countries than here and, while organised as a company, has half of its capital owned by the Corporation of the City of Manchester. A few ports, notably Bristol, are owned by local authorities and some minor ports of local value are in the hands of non-statutory companies or even private individauls.

These features of our port organisation, therefore, offer a varied and interesting field to the student of transport administration. It would be a great mistake to attempt to impose a flat and dull uniformity where conditions are so different. Yet there may be room for well-considered re-arrangements.

In the interests both of our overseas trade and of our coastwise shipping it is a matter of great national concern that our dock and harbour dues and the cost of handling cargo should be reduced to a minimum and that our ability to load and discharge vessels speedily should be raised to a maximum. It follows that capital expenditure should be properly directed and not dissipated in any competition which would be nationally wasteful. The whole subject is a complicated one and of a nature which makes it peculiarly suitable for joint review by all the interests affected, as the Dock and Harbour Association have proposed. One reform which everyone desires to see retained in an appropriate permanent shape is the decasualisation of dock labour introduced first on the Mersey, then on the Clyde, and subsequently extended upon a national scale.

The New Schermuly Rocket Signalling Device

(Communicated)

The new Schermuly rocket consists of a rocket which, on attaining an altitude of 1,000 feet, ejects a flare of 150,000 candle power which is suspended in the air for almost a minute. So brilliant is this flare that at night it is visible over a radius of about 50 miles.

Moreover, it is much simpler to operate than the old rocket. Instead of a separate igniting device—cumbersome in a crowded lifeboat—the new rocket is in a buoyancy chamber, which is stable even in the roughest weather. All that is necessary is to remove a sealing device, pull a wire loop, throw the container into the sea and the rest is automatic: the rocket is released and any ship or aircraft within a radius of 50 miles will see the signal.

The Schermuly Brothers and their Rocket Signalling Device
Left to right: Mr. Alfred Schermuly holding an International Distress Signal, Capt. Conrad Schermuly, D.C.M., holding a life-line throwing rocket pistol and Mr. Charles Schermuly holding a similar pistol with a buoyant head charge.

Already the rocket is in extensive production. In war-time its usefulness is immeasurable. In peace-time, seamen will be no less grateful to the Schermuly brothers than they are to-day, for besides the normal perils of the sea, drifting mines and other instruments of war will still lurk in war zone waters.

The above-mentioned rocket device was demonstrated by its co-inventor, Mr. Alfred James Schermuly, at Fleetwood recently.

A correspondent reports that the test at Fleetwood, the first made in peace-time, was a complete success. Though it took place at 10 p.m., before it was dark, the flares thrown overboard by Mr. Schermuly about 2½ miles off-shore reached well over a thousand feet and burned with a splendid brilliance. Mr. W. P. Gerrard, the Fleetwood Dock Master, said he had never seen such a brilliantly effective rocket flare nor one of such easy operation. Fishing vessel owners from shore vantage points were deeply impressed by the demonstration.

Another Schermuly life-saving rocket device was also shown. It is the pistol-fired illuminated buoyant rocket head and floating life-line.

Before this invention, lives were lost because the line carrying rocket, falling short of its mark, sank and carried the line with it. The new rocket will carry 250 yards of half inch cord and, as proved by the demonstration at Fleetwood, will float and the line which is of pure cotton has been so treated that it, too, will lie on the water. In addition, by a small electric battery, a white light burns in the nose of the rocket for two hours, if necessary, to enable its course and landing place to be seen by seamen in distress.

Proposed New Graving Dock on the Clyde

Meeting of Local Bodies

For some time negotiations have been in progress amongst the authorities interested in the Clyde for the promotion of a new large graving dock. A meeting was held in Glasgow in May, attended by representatives of the Clyde Navigation Trust, the Greenock Harbour Board, the burghs of Clydebank, Dumbarton, Paisley, Port Glasgow and Renfrew, the Corporations of Glasgow and Greenock, and the county councils of Dumbartonshire, Lanarkshire and Renfrewshire.

Mr. William Cuthbert, chairman of the Clyde Navigation Trust, moved and Mr. Coutts, chairman of the Greenock Harbour Trust, seconded the following resolution : " That in the National interest a graving dock and ancillary works capable of serving the largest naval and merchant ships should be constructed on the Clyde, which offers exceptional advantages, as the present war has shown."

The resolution was unanimously carried, and it was agreed that copies should be sent, immediately to the Secretary of State for Scotland, the Lords Commissioners of the Admiralty, the Ministry of War Transport, the Scottish Council on Industry and the Clyde Estuary Committee (chairman, Lord Cooper). It was made clear at the meeting that the site on the Clyde was a subject still under consideration and not before the meeting.

Subsequently, it was announced by the chairman of the Clyde Navigation Trust, in his address to them on June 5th, that the Trustees had agreed to transmit to the Admiralty for consideration drawings showing a possible scheme in the upper reaches of the river within the Trustees' jurisdiction and capable of serving the largest naval or merchant vessels.

The Port of Melbourne

Impending Developments

It has been announced in the press that Mr. Dunstan, Premier of the State of Victoria in the Australian Commonwealth, has made a statement on impending port development works at Melbourne, which involve an outlay for the first two years after conclusion of the war with Japan, of £1,573,000. The first instalment includes the widening and deepening of the navigable channel of the River Yarra from the river mouth to the Victoria Dock, the estimated cost of which is £260,000. Set out in detail, the work comprises the dredging of the river downstream from No. 30 berth, South Wharf; the disposal of the dredged material on low-lying areas at Fishermen's Bend and Stony Creek Basin; and the building of a retaining wall along the South bank of the river.

Before these works can be actually put in hand, it will be necessary to lower the main sewerage tunnel, which passes under the river. That alteration, which had been accepted by the National Works Council for the initial post-war programme, would be undertaken by the Metropolitan Board of Works. The project would be financed jointly by the State Government, the Harbour Trust, and the Board.

Mr. Dunstan added that other Harbour Trust works which had been approved included: Construction of two coal berths with mechanical discharging gear, and wharf sheds with rail and road connections at Appleton Dock, at an estimated cost of £497,000; recondifioning and reconstruction of wharves, cargo sheds and roads, at a cost of £432,000; and construction and fitting out of a tug hopper barge and dredger, at a cost of £235,000.

New Transit Shed at Long Beach.

The Board of Harbour Commissioners of Long Beach, California, U.S.A., contemplate the erection, at a cost of over a million dollars, of a spacious transit shed designed to afford the most up-to-date storage facilities. The structure, stated to be " nearly four times the size and capacity of any shed in the great ports of the United States," will be 1,152-ft. long and 200-ft. wide. It will have a wide front platform and the interior will be free from obstructing columns.

North-West Port District

Tour by Minister of War Transport

The Minister of War Transport (Lord Leathers) has, during the past month, made an official tour of the ports in the North-west District of England, accompanied by the Regional Port Director (Mr. R. P. Biddle), and in sequence by officials of the ports visited. In the case of the Merseyside ports, he paid a warm tribute to the officers and workers for the part they had played in the prosecution of war work.

At Liverpool, he said it was a matter for congratulation that the dock workers had seen to it that at no time during the blitz days was the port closed by enemy action. In 68 months Liverpool had discharged 70,000 tons of cargo and landed 110,000 planes for use by the British and American Air Forces. There was also a tremendous tonnage of oil for warships and planes, and the colossal export tonnage handled by Merseyside dockers. The loading and discharge of vessels at Liverpool and Birkenhead employed 17,860 workers, and 9,500 dock recruits were trained for this specialised work.

In Manchester, after sailing up the Ship Canal in a tender, he inspected the port and rehabilitation centre for dockers. A ship canal official stated that 34,000,000 tons of imports were discharged along the canal during the war and traffic on the waterway had increased by over 50 per cent. Every attempt by the Germans to mine the canal had failed. The seaway was never stopped, nor was work stopped at the docks by a single day of raids. Manchester, during the past three years, had exported to Russia about 250,000 tons of machinery, weapons and foodstuffs. On many occasions Manchester dockers achieved the quickest ship discharge rate of any port in the country.

Bombay Docks Re-instatement.

Included in the reconstruction work consequent on the damage done in the recent catastrophe at the Port of Bombay, which was the subject of extended notice in the issues of this Journal for October, 1944, and March last, are three swing bridges, one of which has been completely re-constructed. There is now a new network of six miles of rail track, 26 acres of paved area and over a million square feet of quayside sheds either entirely new or re-constructed. The rebuilding of the shattered quay wall at the Victoria Dock, begun in May last year, is now completed.

Aberdeen Harbour Defence Control.

The fortunate escapes from enemy attacks enjoyed by Aberdeen harbour are detailed in a report to the Harbour Board, just issued by the Harbour Civil Defence Controller, Mr. James Hay Petrie. The number of bombs which actually fell within the harbour area was extremely small, although there was not doubt but that it was a main target. Bomb damage totalled £13,261 on Board property and of this £9,017 was expended on repairing the damage done to Albert Quay on August 7th, 1942.

Shipping Difficulties at Portishead.

The subject of shipping difficulties at the Portishead Docks of the Port of Bristol Authority was raised at a recent meeting of the Bristol City Council. Mr. A. L. Duggan said that the length of the entrance lock had prevented ships entering and he asked whether, instead of renewing the existing lock gates, as authorised at a previous meeting of the Council, the Port Authority had considered placing the gates at the sea entrance farther out by continuing the wall. He also asked whether it was the post-war policy of the Authority to make full use of Portishead Dock, and, if so, if it were not important to increase the length of the lock to allow vessels of larger size to use Portishead when Avonmouth Docks were full. Alderman A. W. S. Burgess, chairman of the Port Authority, told Mr. Duggan that expenditure on lock extension would not be justified and that it was not practicable to extend the lock wall. The principal controlling factor was the depth of water on the sill. Alderman Burgess added that use would be made of the newly-constructed berth as soon as possible.

Port of Bristol Authority

War-time Activities of the Port

Excerpts from Report to the Docks Committee by R. H. JONES, O.B.E., General Manager

It has only recently been made permissible to give an account of the considerable part which the port has played in the national war effort. By virtue of its geographical position and the diversion for strategic reasons of shipping to west coast ports, Bristol was called upon to take heavy responsibilities in regard to overseas trade, and the Avonmouth Docks have been used almost to capacity. The achievements add a notable chapter to the long history of the port.

The outbreak of war in September, 1939, found the port well equipped for the change over from peace to war-time activities. The construction of the extension of the Royal Edward Dock to provide four additional deep water berths, a new wharf at the Oil Basin, and the reconstruction of a further oil berth were hurried forward to completion in spite of the many difficulties of labour and materials, and have proved of great value in handling additional traffic. Many other works and improvements and additions to our facilities have been undertaken, some as Government grant-aided schemes, the most notable being the construction of a tidal oil berth and jetty at Avonmouth and an additional deep water berth and quay and sidings at Portishead Dock. Special equipment, such as powerful cranes, locomotives, barges and tugs were provided partly by the Authority and partly by or through the agency of the Ministry of War Transport. In the later stages, the U.S. Army also provided additional equipment to assist in the handling of their cargoes.

The nature of our trade changed very materially under war-time conditions, and military requirements brought many unusual types of cargo, including vehicles of all descriptions, such as tanks, guns, locomotives, aeroplanes, landing craft and a variety of explosives. With the advent of war-time controls, our peace-time imports of grain, tobacco, cocoa, fruit, paper, timber, etc., were considerably diminished and some entirely disappeared. These losses were, however, more than made good in many other directions as the trade statistics, referred to later in this report, will show. The outstanding feature of the port's contribution to the nation's war effort has been the vast increase in the petroleum trade. The immense tonnage, however, has not detracted from our capacity to deal with other cargoes, and the port has taken its full share of shipping activities in connection with the military campaigns in all theatres of war, culminating with the D-Day operations. A very substantial part of the supplies for the American armies in the field was shipped from the port. I am pleased to record that our achievements in connection with these operations were acknowledged by Major General Frank S. Ross, Chief of Transportation, U.S. Army, the following being an extract from a letter received:—

> "The part played by the ports operated under your direction during recent months has been an important factor in the success of our invasion forces. The splendid co-operation and assistance which you have rendered during this period is gratefully acknowledged.
>
> "I extend my thanks and sincere appreciation for a job well done. I know that with your continued support, we will not fail to accomplish our mission."

The working of the port has been subjected to a substantial measure of control by the Ministry of War Transport. The Port Emergency Committee, comprising representatives of all interests, which was set up prior to the outbreak of war, started to function immediately war was declared. Various Sub-committees and Special Committees to deal with questions relating to traffic allocation, port storage, stevedoring, barging, tug operations, etc., were also brought into being. Following the appointment of Regional Port Directors for the Mersey and Clyde areas, Mr. R. Hugh Roberts was appointed Regional Port Director for the Bristol Channel Area in February, 1941, and this area was later extended to include ports in Devon and Cornwall. A control for the distribution of war-time shipping, known as the Shipping Diversion Room, was set up at the London H.Q. of the Ministry in September, 1939, and various members of the staff have in turn served on the control continuously since that date. Control staffs of all branches of both the British and U.S. fighting services were established at the port, and the liaison between these services and the civilian interests has been most effective in dealing with service cargoes. I am pleased to acknowledge that the close co-operation and assistance rendered by all these various bodies materially contributed to the smooth working of the port and enabled us to overcome many difficulties, particularly during the days when we were frequently subjected to enemy air attack.

I cannot speak too highly of the contribution made by all dock workers in securing the maximum war effort and, in particular, the quick turn-round of shipping. In spite of black-out conditions and air raids, the docking of large troop ships, hospital ships, petrol tankers and vessels carrying large quantities of explosives has proceeded on every tide at Avonmouth, and the period of tidal locking has been extended to meet war requirements. Every praise is due to the pilots, boatmen, tug boatmen and nautical staff for their high sense of duty. Rail and road transport have each played an important part in the clearance of goods and the prevention of congestion on the quays and in the transit sheds and the daily transport of dock workers, often under the most trying conditions.

In common with other large undertakings, the port had to make substantial provision for Civil Defence measures. It was obvious when enemy air attacks started in earnest on this country that the docks were likely to be subjected to heavy scale attacks and that special measures would have to be undertaken to meet this emergency. The Government decided that military fireguards should be stationed at West Coast ports, and there is no doubt that the timely action taken by the military saved the Avonmouth Docks from large scale damage on more than one occasion. When the National Fire Service was formed, it was only natural that special consideration was given to the port, and a fire service station and two sub-stations were set up within the Avonmouth Docks, special measures being provided to combat oil fires. The N.F.S. have also throughout the war period provided patrols and fireguards in connection with the handling of inflammable and dangerous cargoes, and I am pleased to record that their effective co-operation and prompt action have prevented any serious consequences from outbreaks of fire. A Report Centre was set up and continuously manned by the Port Authority's staff; a first-aid party and rescue squad were also maintained every night by members of the staff. A considerable number of the Authority's and tenants' employees were trained in fire-fighting, anti-gas and decontamination measures. Special mention should be made of the work of the W.V.S., who have materially contributed to the war-time well-being of dock workers by providing and operating a number of mobile canteens at the docks. The demands made for these services, whether during air raids, or any time, day or night, always met with a willing response and have been greatly appreciated by all dock workers.

As a result of enemy air attacks, the City Docks suffered badly. Princes Wharf Granary, which for more than half a century had been a conspicuous and familiar feature, was totally destroyed. Seven transit sheds were also demolished and six others badly damaged. At Avonmouth, although some of the transit sheds and other larger buildings suffered, the damage to the Authority's property was not so severe, but several dock tenants had their premises totally destroyed. In spite, however, of the inconvenience caused, the work of discharging and loading vessels was carried out without interruption, and there were relatively few mishaps considering the many risks inseparable from war-time operations.

Trade Statistics

The Government took over the control of shipping and the importation and distribution of the principal commodities from the outbreak of war. Imports were soon restricted to those essential for the life of the community and the successful prosecution

Port of Bristol Authority—continued

of hostilities. The following table shows the drastic reductions which had to be made in imports into the country:—

Imports of Dry Cargo into the United Kingdom

Year		Food. Tons	Raw Materials. Tons	Finished goods, munitions, etc. Tons	Total Tons
1934-38 (average)	...	22,000,000	26,000,000	7,000,000	55,000,000
1940	...	18,800,000	21,500,000	1,000,000	41,300,000
1941	...	14,700,000	15,000,000	800,000	30,500,000
1942	...	10,600,000	11,500,000	800,000	22,900,000
1943	...	11,500,000	12,800,000	2,000,000	26,400,000
1944 to June	...	5,400,000	6,100,000	1,300,000	12,800,000

The development of the war situation restricted the use of ports on the East Coast and consequently the western ports were called upon to deal with the major part of the overseas traffic.

[Another table in the report gives the following local trade figures for the year April 1st, 1944, to March 31st, 1945, which constitute a record for the port: Vessels, 9,944; net register tonnage, 5,782,713. Imports and exports, foreign and coastwise. 8,934,611 tons.]

Labour

Great efforts were required from all classes of dock workers to secure the quick turn-round of shipping, particularly during the days when the Battle of the Atlantic was at its height, and some examples of the good work performed have already been given. Overtime has been worked continuously, involving long hours and a heavy strain on men, who had to leave their homes very early in the morning and not return until the late evening. During the winter months work had to be carried on under the difficulties of black-out and frequent enemy air attack, both by day and night. With the exception of two minor strikes of short duration, there has been no dispute entailing a complete stoppage of work during the war period. Piecework rates, which had formerly been limited in application, were made general with a view to increasing output, and increases in pay to meet the rising cost of living were granted in November 1939, July 1940 and March 1944.

The introduction of the Essential Work (Dock Labour) Order in 1941 and the inauguration of the National Dock Labour Corporation, Ltd., brought entirely new features into the port labour arrangements, the main objective being to secure the mobility of labour and to decasualise the industry by guaranteeing, subject to certain conditions, a minimum rate of pay, whether a man is able to obtain dock work or not. A major change of this nature naturally gave rise to a good many problems, and I am pleased to state that such difficulties as appeared were quickly overcome and that as a war-time measure the Dock Labour Scheme has worked quite well in this port. Both employers and workers in the industry are unanimous that the policy of decasualisation introduced under war conditions must not be allowed to lapse, and it is up to both sides of the industry to see that a workable peace-time scheme is prepared which will be fair to both sides and at the same time enable the industry to operate on an economic basis.

Since the early days of the war, the local labour force has been augmented by a number of dock workers transferred from the South and East Coast ports and at times the number of transferees amounted to more than 1,000. In addition, considerable use has been made of British and American military labour.

Any reference to labourage arrangements would be incomplete without a tribute to the co-operation and assistance received from the officials of the Transport and General Workers' Union and other Unions. Their task during the war period has been no light one, and the fact that there has been no serious labour trouble in the port is indicative of the effectiveness of their work.

In common with other industries, the feeding of the workers has entailed special attention. A large central canteen and two subsidiary canteens were constructed at considerable expense at Avonmouth and their improved facilities have been very fully utilised.

Staff

The stress of war-time conditions has borne heavily upon all sections of the Authority's permanent staff, entailing long hours of arduous work, and it is largely by their zeal and exertions that so much has been accomplished. My colleagues and the clerical staff have also shared the burden and have loyally co-operated in overcoming the many difficulties which have had to be faced in the national interest. Although most of our employees, with the exception of the younger age groups, have not been liable for service, 177 members of the Authority's permanent staff joined H.M. Forces and three have been mentioned in despatches for meritorious conduct. It is with deep regret that I have to report that eight lost their lives on Active Service. Five members of the staff have received honours from H.M. The King, three being awarded the M.B.E. and two the B.E.M. In expressing my pleasure on the conferment of these distinctions, I would like to add that honours have been awarded to several members of the staffs of local shipping, stevedoring and ship-repairing firms

In concluding this report, I feel sure the Committee will appreciate that the notable war-time achievements of the port in the national interests have only been made possible by the close and willing co-operation of all the varied interests, and have once again proved the ability of the port to handle and distribute efficiently all types of cargo and a much greater volume of tonnage without unduly straining our resources. I feel confident that the war-time experiences and contacts gained will prove of extreme value when the time comes for the country to resume peace-time trading.

Eyemouth Harbour Repairs.

Eyemouth Harbour Trustees have announced their intention to carry out repairs to piers, slipway, timber coping, etc., at Eyemouth Harbour, and are inviting tenders for the work.

Formation of Southern Section of Institute of Transport.

A meeting of members of the Institute of Transport in the counties of Dorset, Hampshire and Sussex, was held in the Conference Hall of the Civic Centre, Southampton, on June 9th, and it was resolved to set up a Southern Section. The meeting, which was accorded a welcome by the Mayor of Southampton, had been convened by Mr. E. Burrow, the Hon. Corresponding Member of the Council for the area, and was presided over by Mr. M. G. J. McHaffie, Docks Engineer, Southern Railway. After the resolution to set up the Section was adopted, the meeting was addressed by Mr. G. S. Szlumper, C.B.E., Past President and Chairman of the Examinations Committee of the Institute, who welcomed the step which had been taken and expressed the Council's satisfaction. Officers of the new Section were elected as follows:—Chairman: M. G. J. McHaffie. Vice-chairmen: F. C. Bishop, A. F. R. Carling, A. J. Wright. Hon. Treasurer: P. J. Baker. Hon. Secretary: R. C. Hardy.

War Damage to Dutch Ports.

In a farewell address on leaving Great Britain, Dr. P. S. Gerbrandy, Prime Minister of the Netherlands, made allusion to the damage done during the war to Dutch ports. Touching upon the condition of the ports, Dr. Gerbrandy said that the last intended destruction at Rotterdam and Amsterdam was not carried out, the Germans having been told by the Allied High Command that otherwise they would be treated as war criminals. Consequently, the major part of the ports had been saved. The lock gates at Ymuiden had been damaged, but the canal up to Amsterdam was intact. Some damage had been done to the smaller ports, but all were in a workable condition. The main bottleneck was port clearance. The inland water-ways were intact and 80 per cent. of the barges were available, but the big problem was the lack of coal and oil fuel to drive them. Road transport was bad owing to most of the bridges having been wrecked, and rail traffic suffered from a shortage of material.

The Quayside Rat Nuisance

Problems of Control in New York and Mediterranean Ports

By ERIC HARDY, F.Z.S.

Mediterranean Ports

I recently had the opportunity, when in the Mediterranean countries, to visit several of the leading ports which have to contend with the serious problems of rat control, such as Alexandria, which last year avoided a dangerous threat of Bubonic plague (rat-bite fever) outbreak only by efficient and skilful port medical control; Port Said, where rats are probably even more destructive in the harbour; and Haifa, where an effort to seek official aid in checking a rat-infested building brought the astonishing question from an official as to whether or not the rats were " big ones," and, on being told that it was not known if they were any bigger than usual, except that they were rats—just rats—the rat-catcher replied that he could deal only with rats if they were big ones! The story got into the pages of the *Palestine Post*, so that by now the position has probably been rectified.

The position at Alexandria has been studied so often, and the port is well-known as the origin from the point of view of identification of two well-known varieties of the common black ship rat which have been transported by shipping to most of the world's harbours, that it might prove more interesting if I take, as an example, the rat population of another Mediterranean port, Haifa. The position at Jaffa, further up the coast, is much the same, although the rat population is not so large.

The usual black and brown rats inhabit the port, and in addition there are three varieties or sub-species of the black rat. They have been described fairly well in detail by Professor Bodenheimer, of the Hebrew University in Jerusalem, and probably are identical with those of other ports. The brown rat, *Rattus norvegicus*, is the same clumsy sewer and underground rat, with round ears that just reach the eye when turned towards it, a tail with 210 scale rings and in length much shorter than the body. The black or ship rat, here called the house-rat, *Rattus rattus*, is more slender in body, much more skilful, nimble and arboreal in activities, with longer ears that cover half the eyes when turned towards them, a longer tail that equals or exceeds the body length and which has 265 scale rings. Of its varieties, the Alexandrine rat, *Rattus rattus Alexandrinus*, is more greyish-brown above, and greyish-white or yellowish below, but with only a gradual transition between these two colours on its flanks. The fruit rat, *Rattus rattus frugivorus*, is also greyish-brown above and whitish-yellow below, but these two colours terminate abruptly along its' flanks with a noticeable effect, as with the common stoat. *Rattus rattus flaviventris* is a further variety, more reddish above and dirty yellow below, with only a gradual transition between these two colours.

In the harbour buildings and the store-houses, the rats have been brought under control quite easily with a poison preparation of Thallium sulphate mixed with mashed potatoes. As in many Eastern countries, the common house rat here is the same as the ship rat, whereas the brown or sewer rat, the typical town rat of England and America, is found mainly at the large ports like Jaffa, Haifa, Port Said and Alexandria. The Alexandrine rat is the commonest form in Palestinian buildings, while the " imported " tree-rat seems to prefer districts with humid soil. Of course, all the black rat varieties are tree rats, in that they climb trees and tall buildings and avoid sewers and underground passages. Near Hederah, tree-rats destroyed orange groves by nibbling their bark and wood at the end of the summer. The reddish-brown variety, which is very similar to occasionally-caught specimens I saw at Liverpool, prefers more arid desert conditions, although in Egypt these conditions were found immediately I left Port Said and other cities. Yet, for some reason, rats do not seem to cause so much damage in Palestinian ports like Haifa and Jaffa compared with my experience of them in western ports. Maybe because the balance of species is different and the brown rat is the scarcer?

New York Harbour

Since the summer of 1940 there has been a steady increase in the number of ship rats in New York harbour, similar to what occurred at most British ports under war-time conditions. Yet the U.S. Public Health Service, operating from Staten Island in The Narrows, has held in check any risk of rat-bite fever. Ship fumigation is as rigorously carried out as ever. In 1939 the fumigation returns showed an average of 12.4 rats killed per ship; in 1940 it rose to 21, and in 1942 to 32.1. One Oriental freighter had 600 aboard. For the first time since 1900, the plague flea was identified on rats in the harbour, but I should think this is either an exaggerated statement or it had been overlooked, for at Liverpool the plague flea occurs fairly freely on black rats on ships, but is very rarely infected with the trypanosome or Bubonic plague. The New York identification was made on rats on the French tramp, *Wyoming*, from Casablanca.

New York's rats are most numerous in the old " Down Town " slums and the waterfront. However, rats are no discriminators amongst society, and the Department of Health inspectors reported catching 236 rats in three nights' work in the basement of a fashionable East Forty Street hotel. Ship rats have been found nesting frequently in the roofs of elevator stations (incidentally, I have seen several in the Liverpool and London tube stations, but mostly brown rats). As at Liverpool, many of New York's brown rats breed during summer in burrows in the city parks and open spaces, returning to the warmth of the buildings for the winter. Central Park seems to be their favourite summer vacation ground.

However, some exaggerated stories have been told of American rats, by American writers who, with all due patriotism, no doubt must boost their rodents superior to those of Europe. A writer in the famous *New Yorker* not only attributed to them the frequent habit of biting both babies and sleeping adults, but attributed to the black rat the Olympic honour of jumping 3-ft. horizontally and making a vertical leap of 2-ft. 2-in. Their brown rats can " rip the hide off a cat," and he declared that the city firemen go about their business in fear of them, and even told the tale of a West Side stable boy who, in broad daylight, tried to kill a rat with a mop, but the rat, too tough for Mrs. Mop, ran up the broom handle and tore the thumb nail off the boy's left hand! That was something even Frank Buckland could not put in his *Curiosities of Natural History!* One prize specimen, fattened in a Manhatten brewery, measured 1-ft. 8½-in. long and weighed 1½ lb. when clubbed to death. San Francisco rats must look to their laurels!

New York has three rats: the usual brown house or sewer rat, the black ship rat (which for some peculiar reason is often called the English rat, although its origin is Asiatic, like that of the others), and the Alexandrine rat, also nick-named the Egyptian Rat and the Roof Rat (although the black rat is also a roof rat). The proportion, estimated from the rat-catchers' returns, is 90 per cent. brown, 9 per cent. black and 1 per cent. Alexandrine. The brown rat is reported to be so aggressive against the others as to kill and eat them. The diseases they carry include Brill's Disease (a form of typhus), which appears to be quite common in the rat-infested ports of the Southern States, spirochaetal, jaundice, trichinosis and tularemia. The plague flea of *Xenopsylla cheopsis* has been found to average about 8 specimens per black rat, which is typical of most foreign ports in Europe. But these fleas are rarely plague infested.

In New York the rats are reputed to rear 3 to 5 litters a year, with 5 to a record of 22 young in each litter. A single captured pair reared 7 litters in 7 months, " carrying " for 21 to 25 days and breeding when four months old. They live three to five years in captivity.

About 300 rat extermination companies do business in New York, the Guarantee Exterminating Co., of Fifth Avenue, probably being the largest. They are agents for many steamship lines. Here much more use is made of the sticky trap (glue-board) than in English ports, and there is also much use of rat-proofing and

The Quayside Rat Nuisance—continued

of break-back traps. Before rationing, the sticky traps were baited with ground beef, canned salmon and cheese, but since these have been restricted, success has been achieved with peanut butter as a rat bait. The famous Empire State Building is said to be a perfect example of rat-proofing.

The brown rats here have been reported to tunnel through the cheap cement-and-lime mortar of basements and they have been accused of starting many undetermined fires by gnawing the insulation off electric wiring and by a passion for match-eating (which surprises one, seeing that safety matches should be poisonous to them). The U.S. Department of the Interior's biologists estimated the total 1943 rat damage at £40,000,000. The last serious plague outbreak was at Los Angeles in 1924-5, five years after the New Orleans outbreak at the end of the last war. Ground squirrels probably help to spread it in the west coast districts. New York has no plague record, but that does not preclude the usual precautions, which have been carried out since 1921. In one pre-war month, for example, the New York Quarantine Station boarded and inspected 560 incoming ships and found 132 were infected to some degree with rats and 24 were fumigated, resulting in 810 dead rats. They are faced with the same war-time difficulties as English port sanitary officials, although New York has gained an advantage in employing coast guardsmen for fumigation work, using the usual hydrocyanic acid gas liberated from cans. Dead rats are combed for fleas, the blood of which is mixed into a solution and fed to guinea pigs; their spleens and livers are then post-mortemed for examination for plague germs.

Rat Increase in Middle East

One of the most interesting things I have learned during my recent visits to ports in the Mediterranean area whilst studying rats is the spread in recent years of the Norwegian or brown rat, *Rattus norvegicus*. At present the Alexandrine rat is the dominant form of ship, town and port rat throughout the Middle East, and this has been the position for centuries. I can envisage that in the next decade there will be a steady influx of brown rats which, although not dominating the harbour areas, will oust the black rats from the port hinterland and most of the famous towns of the East. This I have noticed particularly at Haifa and Jaffa. When at the Biological Institute at Tel Aviv—the town for which Jaffa is the port—M. Mendelssohn, the director, told me that about 10 years ago the brown rat first appeared in Tel Aviv and at the Biological Institute, which maintains a large collection of living mammals and birds, it was seen fighting the resident black rats, which had always been there. Eventually it drove out the black rats and now they have only brown rats and no blacks. This applies to Tel Aviv as a town, although black rats still dominate the Jaffa port area. *Rattus rattus* is now a very rare specimen in Tel Aviv. At Alexandria, however, there is only *Rattus rattus*.

One of the reasons for this change, or possibly an encouragement, is the change of building in modern Palestine and Cairo. In place of the old wooden and mud structures which dominate the narrow streets of the native quarters of old cities, there have been built in the past decade many large stone buildings which are rat-proof, so far as the climbing black rat is concerned. The suburbs of Cairo, at Maardi, the modern quarters of Tel Aviv and the Greek, German and modern parts of Jerusalem are all handsome stone buildings, well spaced apart.

Only the brown rat is now the typical rat of Haifa and Tel Aviv, away from the ships, but elsewhere in Palestine it is still very rare and, as in the rest of the East, the black rat remains the common one. At Jerusalem University, Dr. Shouloff, of the Department of Zoology, told me that the common rat of the city is the grey-bellied *Rattus rattus alexandrinus* and both the black rat, *Rattus rattus*, and the Norwegian rat, *Rattus Norwegicus*, are rare there. However, the University collectors did find a black rat at Lake Hulen, in the north of Palestine.

Personally, I think that the conversion of the world's large, heavy bombers into cargo-carrying planes will increase the danger of rat distribution, not only by introducing the Norwegian brown rat into these Eastern ports and cities, which for so long have been dominated by various forms of the black rat, but by spreading disease-infected black rats from the plague danger zones. The authorities, of course, are fully aware of the danger, and no doubt in time will institute the compulsory fumigation of planes. I have found that in the Eastern cities and ports there is no more effective control on the rat population than in our Western ports, despite the presence of their native mongoose. But the gradual elimination of the black rat from so many parts of Tel Aviv and Haifa by the adoption of modern, large, stone, rat-proof buildings, supports the theories advanced in the west for several years now, namely, that the most effective future for rat control lies more in the extension of rat-proofing than the exploitation of poisons, fumigants, viruses and natural enemies.

The Port of Ras Tanura

New Saudi Arabian Oil Port

The following account of recent installations at the new port of Ras Tanura, in Saudi Arabia, is contained in a communication from Bahrein by a special correspondent of *Lloyd's List*:

Ras Tanura, where Liberty ships have been calling since last July, is a low, narrow, sandy peninsula about five miles in length on the mainland of Arabia, about 40 miles north-west of Bahrein. It is a new port now being used by the Arabian-American Oil Company, who have already landed fully 100,000 tons of cargo, mostly from the United States, in connection with the building of the port and the new refinery. The approach is marked by beacons, probably laid by the oil company, and it has been usual for American ships proceeding to Ras Tanura to pick up an oil company official at Bahrein to advise on pilotage.

The anchorage is on the east side of the spit and is so exposed that delays to shipping on account of rough weather have been fairly frequent. The holding ground is of sand and coral, and is said to be fairly good. At present all cargo is barged about two miles to a pier on the inside of the spit. This pier, which is capable of working three barges simultaneously, has a crane with a lifting capacity of 50 tons, and mobile cranes which are used as required. A new pier with about 36-ft. of water alongside is in the course of construction on the east side of the spit, and is now almost completed. The " T " head of the new pier is 900-ft. long, and it is expected that four ships will be able to berth there simultaneously—two on the outside and two on the inside—and in addition to mobile cranes there will be three fixed cranes, the centre one having a capacity of 125 tons.

At present there are 16 steel barges, each of about 200 tons capacity, four 100-ton wooden flat barges, two diesel sea tugs drawing 8-ft., and two or three towing launches available for working ships at Ras Tanura. Part of the cargo shipped to Ras Tanura is barged to a stone pier at Al Khobar, about 24 miles south of Ras Tanura, to which port deep ships are unable to proceed as the channel at times has as little as 8-ft. of water. So far the average daily rate of discharge at Ras Tanura has been about 300 tons deadweight. Two ships can be worked simultaneously.

Press Visit to London Docks.

At the invitation of the Port of London Authority, a visit was paid by representatives of the Press on June 7th to some of the docks of the Authority for the purpose of an inspection of their condition and of the influence of the war on their shipping facilities. The docks in question, King George V., Royal Victoria and Albert, East and West India and Millwall, were all seen to be busily engaged in the discharge and loading of ships. Although some time must elapse before they are restored to full operational efficiency, they have wonderfully survived the tremendous ordeal to which they were subjected during the war.

Birkenhead Docks

Medical Centre for Dockers

A medical centre to provide first-aid treatment for dockside workers at the Birkenhead Docks has been opened by Mrs. R. J. Hodges, the wife of the General Manager and Secretary of the Mersey Docks and Harbour Board. In the course of the proceedings, **Sir Thomas A. L. Brocklebank,** Chairman of the Board, said the three medical centres on the Liverpool side of the dock estate had now been working for 18 months, and no fewer than 42,533 patients had been treated. This showed that the medical centres were fulfilling a very great need and that the work was to the advantage of the national effort in shortening the time in which injured men were absent from their work, as well as being an advantage to the men themselves.

Mrs. Hodges, in opening the centre, said it was obvious that the committee had done everything possible to make the centre quite up to date with all modern hygienic arrangements. She said it was generally recognised in these days that the welfare of the workpeople was an essential service and that good health was an indispensable part of general efficiency.

Alderman S. Mahon, Area Secretary of the Transport and General Workers' Union, thanked the Mersey Docks and Harbour Board and the Ministry of War Transport for the assistance thus being given to the dockers.

Buoyage of the Clyde

Revised System of Lighting in Navigable Channel

At a recent meeting of the Clyde Lighthouses Trustees in Glasgow, Mr. G. A. Workman, the chairman, made a statement on alterations which had recently been effected in the buoying and lighting of the navigable channel. He said, as follows:

Instead of red light on the south side, white lights had been installed, while red lights were in use on the north side, with the result that the channel from Kempock Point to the eastern end of the Clyde Navigation Trust's boundary was now uniformly lit. Cloch Lighthouse had been closed, while Toward was only lit intermittently, as and when required. The lighthouse on Cumbrae was only allowed to show about one-fifth of its usual power, and all lighted buoys were also only allowed to show a very reduced light. He was glad to say, however, that all lighthouses and buoys were now at full power, and, with the exception of Cloch, all other lighthouses were giving their pre-war fog signals.

The talking beacon at Cumbrae would, in due course, be renewed, but the Trustees were considering the purchase of a modern installation. Until that was supplied the existing talking beacon would, when overhauled, be carrying on its functions. A new compressor had been installed at Toward, and if in future a more powerful fog signal at Toward was decided upon, the new compressor would have sufficient power to deal with it. After careful consideration and consultations with the pilotage authority and others, it was decided to lay down a new buoy to mark the south entrance to the channel. That buoy was now in position and giving satisfaction.

The Institute of Transport.

The under-named have been elected by the Council to hold office for the year commencing on October 1st, 1945:—President: Sir Frederick Handley Page, C.B.E. Vice-presidents: L. W. Cupwell, C. M. Hoffe, F. Rayner, C.B.E., D.S.O., T.D., T. W. Royle, C.V.O., M.B.E. Hon. Treasurer: C. J. Selway, C.V.O., C.B.E., T.D. Hon. Librarian: R. Bell, C.B.E. Hon. Solicitors: Joynson-Hicks & Co. Past Presidents to serve on the Council: Sir Alexander Gibb, G.B.E., C.B., F.R.S., R. Kelso. J. S. Nicholl, C.B.E., G. S. Szlumper, C.B.E., T.D., T. E. Thomas, C.B.E., Sir William Wood.